Enciclopedia en Español de Maquinaria para Minas, Pagina 60

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PRESCOTT
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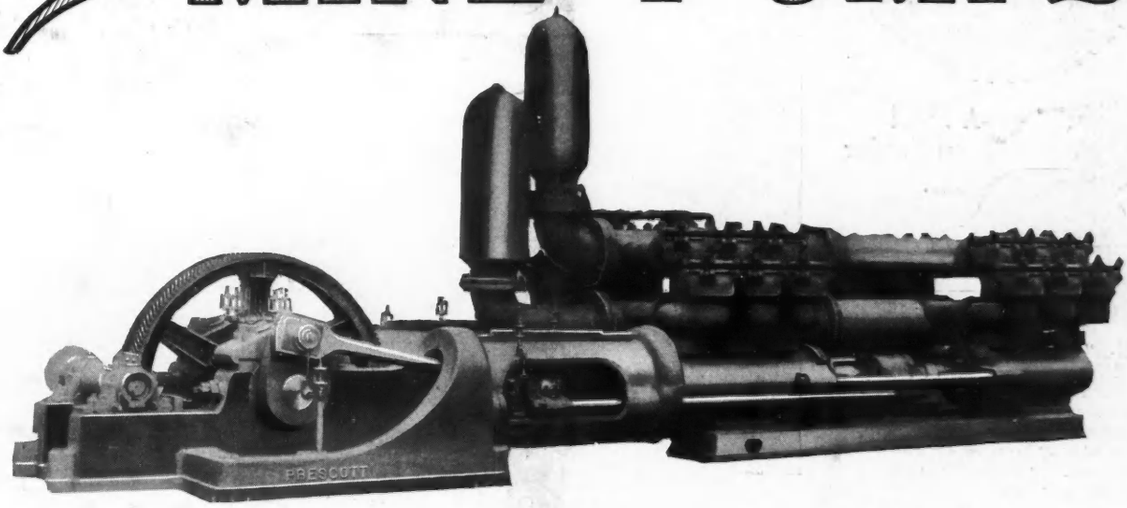

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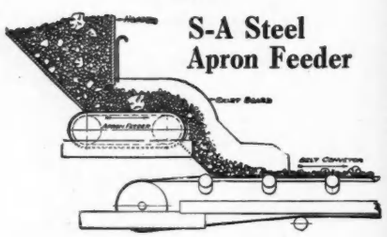

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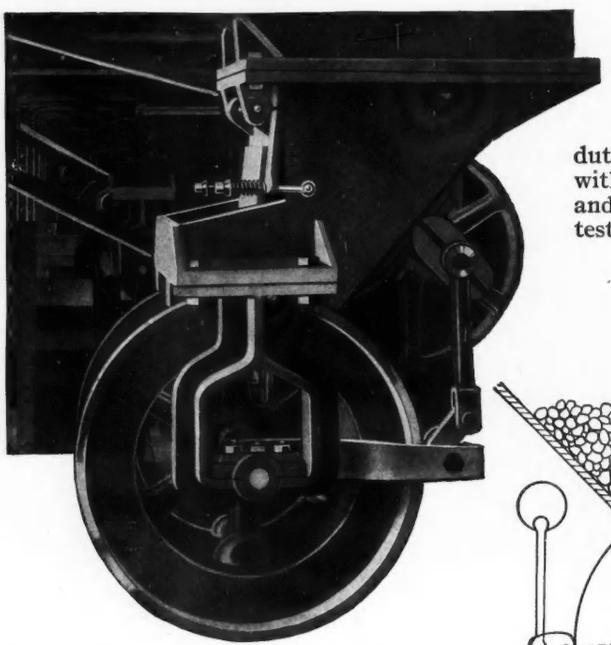

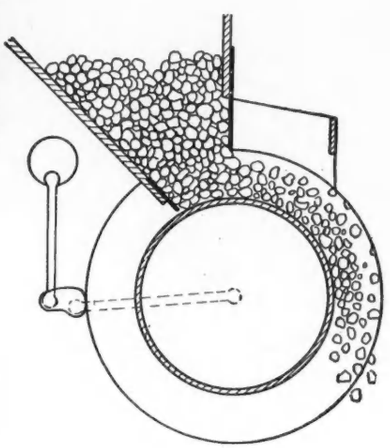

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Engineering and Mining Journal

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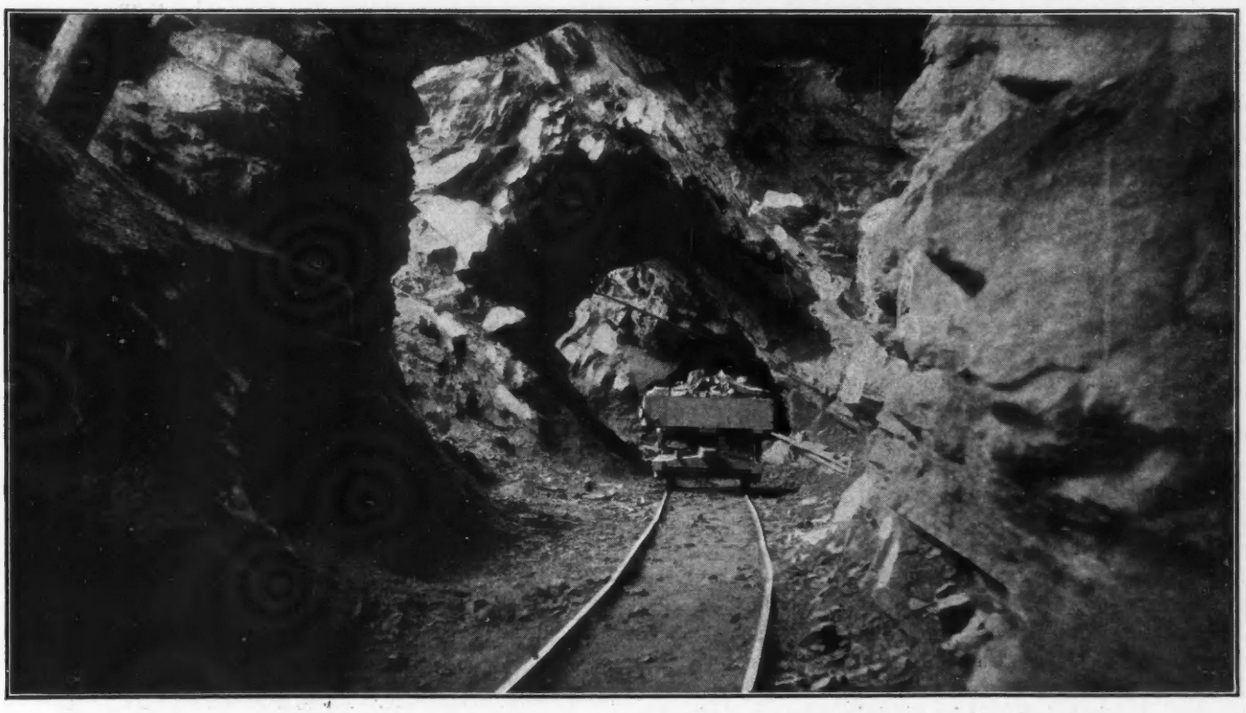
Graphite Industry in New York

By Robert W. Jones*

SYNOPSIS—Development of graphite mines has been fraught with difficulties due to lack of proper methods. However, 67,500,000 lb. has been produced since 1880. The major part of this output has come from the eastern Adirondack region. Graphite is found in veins, both in metamorphosed sediments and in igneous rocks.

The production of graphite in New York State, while never at a very high figure, has been remarkably steady, there having been only one year since 1880 when there was no output. During this period there has been produced from the New York mines a total of approximately 67,500,000 lb. with a reported value of $3,830,751, or an average of almost $0.057 per lb. Nearly this entire output has come from the eastern Adirondack region, covering an area extending north from Saratoga Springs to Crown Point and west about 15 or 20 mi. from the eastern boundary of the state.

In New York State the mining of graphite has generally been carried on under difficulties. The area is underlain with igneous and metamorphic rocks, folded and faulted to such an extent that it is extremely difficult to follow any individual bed or deposit for a distance. Over these formations there is found a deposit of alluvial materials varying in thickness, but in all cases making prospecting a difficult task. Another difficulty to overcome in prospecting is the presence of an extremely heavy underbrush. If the deposits were localized as to formations, the prospecting would be comparatively easy, but almost every formation here is known to carry graphite in more or less workable deposits. The deposits are found in great abundance. Many are of low grade, and in most cases those of commercial importance are held at too high a figure to make them profitable. At all the important outcrops transportation would cut into the cost of production to a great extent.



MAIN HAULAGEWAY IN GRAPHITE MINE, KINGS STATION, N. Y.

Ticonderoga First Center of Graphite Mining

Owing to the great abundance of graphite the deposits were brought to the attention of the prospector at an early date. Probably the earliest commercial enterprise of any size was that of the Lead Hill mines, a short distance northwest of Ticonderoga. These mines soon placed

*17 Magnolia Terrace, Albany, N. Y.

Ticonderoga as the center of the industry in the United States. The Lead Hill mines were worked by the Dixon company and produced a high-grade product for many years, until, because of mining conditions and a lowering of the grade of ore, the enterprise was transferred to the Lake Side mines at Hague on Lake George. This ore was of a different character, and on account of a difficulty in mining and in the disposition of tailings, the mines were abandoned. A large body of ore was opened up at Graphite, about 5 mi. west of Hague, and is now the largest producing graphite property in the state.

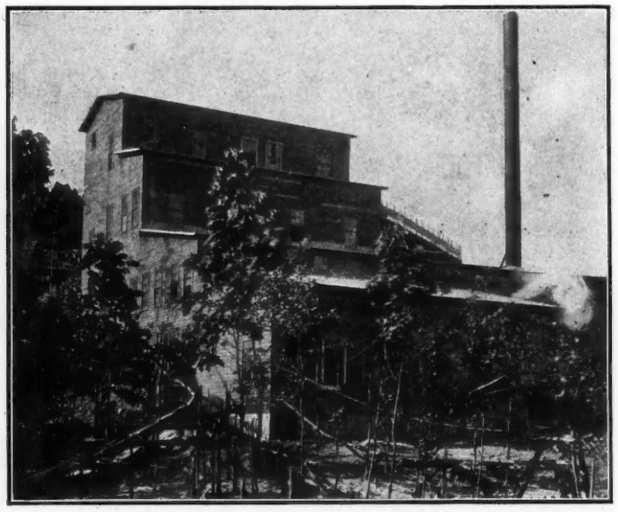
Mills Built before Development of Proper Milling Methods

During several years there was considerable activity in the graphite industry with a consequent increase in prospecting and in the promotion of graphite-mining corporations. The region to the west and southwest of Crown Point at Bear Pond, Clear Pond, Rock Pond, Buck Mountain Pond and Chilson Lake (Eagle Lake) was the center of this excitement and was thoroughly prospected, although with little knowledge of conditions as to the orebodies or the requirements of the finished product. Mills were erected at Rock Pond, Chilson Lake and Buck Mountain Pond. Transportation was difficult, and milling was undertaken before milling conditions were known. The mills are now in ruins and the mines abandoned. The next attempt of any magnitude was made near Porterville, Saratoga County, where a large concrete mill was constructed before an attempt had been made to open the mine. This mill was constructed on plans similar to the other abandoned enterprises, using stamps for crushing with separation in buddles. This enterprise differed in one condition from the others. There was an abundance of ore exposed in two parallel beds with ideal conditions for mining and milling. Financial affairs have kept this property in a nonproducing condition. At a short distance east of Porterville, near Kings Station, several attempts have been made to mine and mill graphite with ore similar to that at Porterville. This property has been taken over by the Graphite Products Corporation, of Saratoga Springs. A new mill has been constructed, the property has been opened by an opencut and through underground workings and at present is making a comparatively large output of high-grade flake graphite. A number of parallel graphite-bearing quartzite beds have been opened and with the present arrangements make excellent conditions for mining, milling and transportation of ore from the mine to the bins.

The ore bed that is being worked at present has a thickness of about 25 ft. The ore is sharply divided at the foot from the lower barren quartzites by a bed of clear quartz. The hanging wall is indefinite, the ore gradually passing out into a micaceous quartzite. A short distance north is found a large body of graphitic schist having at one place a thickness of over 50 ft. Farther to the north is found a small bed of what appears to be a high-grade graphitic limestone, although in milling it will not show the returns that are being made from the quartzites.

There are several grades of ore found in the Adirondack region. Graphite is found in veins, in metamorphosed sediments and in the igneous rocks. It is probable that the early output was made from vein material, as this showed as a coarser crystalline flake and attracted the attention of the early prospector. The output from the igneous rocks has not been very great. The metamorphosed limestones have made some output, although the milling returns from this class of ore have not been so great as was expected. This ore is deceiving. In hand specimens and in carload lots it appears as a high-grade ore. The flakes are large, some of them reaching a diameter of over 1½ in., but in milling it is found that the percentage of good flake is not high. Samples taken from what has been milling ore have seldom yielded, even in picked specimens, more than 3%. Of this amount about one-third will have a diameter of ¼ in. or more. The rest will average a little larger than $\frac{1}{16}$ in. One great difficulty in the milling of limestone ores is caused by the large amount of heavy minerals present of such size that it is necessary to crush fine in order to liberate the graphite, which is completely surrounded by or intermeshed with the other minerals in most cases. Outcrops of these ores occur at Kings Station, Chilson Lake, Ironville and Crab Pond.

The igneous rocks, which in most cases are pegmatites, yield a product somewhat like that from the limestones, except that the flakes are crowded together into thicker bundles. The mill return is about the same as from the limestones. This thickening of the plates makes a product for which there is not the demand that there is for the smaller free flake. While in most cases the pegmatites



MILL OF THE GRAPHITE PRODUCTS CORPORATION, KINGS STATION, N. Y.

are more brittle than the limestones, yet with the presence of graphite the toughness of the rock is increased, making it more difficult to produce a commercial flake. No attempt has been made to work the igneous deposits on a commercial scale. These ores are exposed at Breeds Hill, Spuyten Duyvil Creek Valley and Crab Pond.

Graphite of Metamorphic Origin

The metamorphosed sandstones and shales are responsible for the entire commercial production of graphite from this district at present. These deposits are found throughout the graphite-producing area in great abundance, although not all of commercial value. Owing to the banded nature of the rock, milling is comparatively simple, although the presence of mica offers some difficulties to economical separation. The thickness of these deposits varies from a few feet to as much as 40 ft. with outcrops several miles in extent. Feldspar, being

one of the main rock minerals, has in almost all the outcrops disintegrated to such an extent that the surface ore can be mined easily. This disintegration is due to the presence of sulphides. Pyrite and chalcopyrite are found throughout the ore in lens-shaped masses, having in some localities a thickness of as much as 2 in. and covering an area 4 or 5 in. square. At one locality an attempt has been made to save the chalcopyrite. The graphite content of the ore varies, reaching in a few exposures as high as 10%. The average is about 5%, figured on the recovery from the mill. Prominent exposures of this class of ore are found at Rock Pond, Bear Pond, Spuyten Duyvil Creek Valley, Graphite, Porterville, Kings Station and North Pond. These ores also outcrop between Lake Champlain and Lake George, west and northwest of Whitehall and extending as far north as Putnam Corners. Although it has high-grade ore in many localities, the Whitehall district has never made a success in the production of graphite.

The usual mining methods have been to follow the ore either by an incline or an adit. The property at Graphite is opened through an adit that has followed to a great extent the folding of the quartzite, resulting in a great variety of grades. On account of the low dip and thick orebodies, in most cases, it has been the custom to open side drifts with a slight incline and in an almost parallel direction with the main passageway. These are either with a fall or a rise toward the main line. In the case of a raise either electric power or mules are used for haulage. Crosscuts are then run between the drifts, leaving inclined pillars of ore for support. Owing to the presence of a solid and tough-bedded quartzite hanging wall, it is not necessary to use timber to a great extent. This method of mining has been carried on at the property of the Graphite Products Corporation, extending the inclines from the main haulageways through to the surface along the dip. The intention at this property is to cut the different parallel beds with one main haulageway, drifting along the bed both ways and mining through raises.

Milling methods are kept secret. In general there are two methods—one using stamps and the other rolls for crushing, preceded by jaw crushers. The rough treatment is given at the mine, and the product is then transported to the finishing mill. The Dixon mill at Graphite is equipped with rolls, although stamps were formerly used by this company. The output of the mine is approximately 175 tons per day. The Graphite Products Corporation mill is equipped with stamps. Ten are dropping at present. The intention is to add five more before long.

Mineral Output of Sweden

The official report of Swedish mineral production shows the following in metric tons:

	1914	1915		1914	1915
Iron ore ...	6,586,630	6,883,308	Zinc ore ...	42,279	55,937
Coal	366,639	412,261	Nickel ore .	156	1,642
Gold ore ...	639	221	Pyrite	33,313	76,324
Silver - lead ore	3,100	2,671	Feldspar ..	20,818	12,105
			Quartz	36,128	33,818
Molybdenite	7	37	Graphite ..	56	87
Copper ore..	8,839	10,549	Powdered pyrolucite	81	126
Manganese ore	3,643	7,607			

The production of iron ore from the Kirunavara deposits was reduced from 2,728,363 tons in 1914 to 2,076,512 tons in 1915 owing to the difficulties of shipping from Narvik on account of the war. The electrolytic production of zinc at Trollhättan was increased from 2,299,761 kg. in 1914 to 8,588,384 kg. in 1915.

The metal production, with the exception of iron, was: Gold, 37 kg.; silver, 754; lead, 1,917,678; copper, 4,560,584; zinc, 8,588,384 kg.

Tribute to E. P. Mathewson

There is no mistaking the sincerity of the tribute that was paid to Edward P. Mathewson on Oct. 13, according to the Anaconda *Standard* when the officials, the superintendents and the foremen, and the whole army of employees gathered in front of the general office building to bid farewell to the manager, who is leaving for the East after 14 years of service. During this time he was the friend of every man in the Anaconda Copper Mining Co.'s employ, a confidential adviser always of each one in his work and interests, and a leader in coöperation to run the big plant at highest efficiency, and to make Anaconda better for the part everyone has played in giving his best to the effort for every public good.

It was a personal tribute in every way—to the personality of Mr. Mathewson, and personal on the part of everyone who made up the group assembled on the terrace. The cheers and the good wishes were given in one big volume, but each was expressing his feeling for himself and not merely as one of the throng. It was with dimmed eyes that the men dispersed after the parting scene, and few of them cared to dissemble their feelings.

There has been no such scene in Anaconda as Mr. Mathewson faced at 3:45 o'clock yesterday when Frederick Laist, metallurgical manager and lieutenant of Mr. Mathewson for many years of wonderful accomplishment, escorted him to the south door of the building. On the lawn and terrace were the men of the two shifts and of the other departments. The shift cars to the city had been held for the men coming from work, and furnaces had been banked so the men on the later shift could get away for a half-hour. The day-shift men had been let off a half-hour early so they could attend, and the employees of the foundry and other industries had been released even earlier so they could be present. The number was augmented by citizens who had motored to the works to share in a demonstration that so empathically expressed the sentiments of the community.

Members of the band had taken instruments and they played the national airs while the crowd was gathering.

Mr. Laist's Address

The exercises were brief as they were impressive. As the party stepped through the doors, Mr. Laist spoke as follows:

"Gentlemen: During all the years that Mr. Mathewson has been with us he has always been fair and considerate in his treatment of everyone. He has done more than any other man to make this smelter a better place to work in and Anaconda a pleasanter town to live in. We owe him a debt of gratitude for what he has done for us, and in token of our appreciation and of our regret at his departure we want to give him something to remember us by—something that will be symbolic of our feeling toward him and something that will remind him of the great state in whose welfare he took so effective an interest.

"Mr. Mathewson, on behalf of the local employees of the Anaconda Copper Mining Co., I take great pleasure in presenting you with this golden loving cup and this painting by Montana's great artist. The latter, particularly, we hope, will give pleasure to Mrs. Mathewson as well as to yourself—and in order that she may not forget us and may know how highly we all appreciate her many kindly acts, we desire to present her with these jewels. We hope that they will remind her of the happy years spent here whenever she wears them."

Mr. Mathewson's Response

Mr. Mathewson has made many a happy speech in Montana, but he never gave a better talk than he did yesterday, for the words were straight from his heart and went straight to the hearts of the men. So affected was he by the scene that for a time he could find no words at all, and it was only by a supreme effort that he could make any response. "I cannot tell you," he said, "what it means to me to say good-by to you. I hate to leave Anaconda, for the happiest days of my life have been spent here. I am leaving only because of the opportunity to learn some metallurgy that is new to me, and the chance is one that must not be rejected. I never had a better set of men with whom to work than I have had here, and I am leaving behind me the best men in the world in the best organization on God's green earth.

"One consideration that has prompted me to leave is that I can spend my declining years near my old home. I don't consider myself an old man yet, but I know I can't last forever. I have done all I can for Anaconda and have tried to be square with all of you. I know that you are my good friends, and I ask that you show it by giving my successor the same unwavering loyalty and devoted coöperation that has been given me by everyone."

The big throng joined in cheers for Mr. Mathewson and for Mrs. Mathewson as she waved her hand to them, and as they turned back into the office building the crowd dispersed while the band played "Auld Lang Syne."

The gifts to Mr. Mathewson, in which men of every department on the hill joined, are a magnificant solid-gold loving cup and a painting by Charles M. Russell, Montana's famous cowboy artist. The picture represents a vast herd of buffaloes fording the Missouri, while in the distance are seen the weird hills and buttes of its shores. It is a striking scene of the days that have become historic and is in the best style of the painter, whom it represents at the pinnacle of his art.

On the massive cup is engraved:

"Presented to
Edward Payson Mathewson
by his
Friends and Fellow-Workers
Anaconda, Montana
Oct. 14th, 1916."

To Mrs. Mathewson was presented a magnificant diamond lavalliere and diamond cluster ring, in platinum settings.

At Carpenters' Union Hall that night, Local No. 88 held a special session, at which Mr. Mathewson was a guest of honor and was presented with a solitaire diamond stickpin and receiving tray as a special tribute of the affection he has won from the carpenters. A. G. McLean was the chairman of the evening, and on the platform with him were seated Frederick Laist, L. V. Bender, H. S. Ware, W. N. Tanner and W. C. Capron. Mr. McLean referred to Mr. Mathewson as "the best member Local 88 ever had," and the packed hall rang with applause. Mr. Mathewson responded along the same lines as in the afternoon and with the same manifest emotion. Then a happy inspiration came from some member to demand that he give again a couple of the anecdotes with which the honorary member had regaled the meetings of the union in the past, and these brought the session to a close in the spirit of good fellowship that had been growing for years.

The Anaconda Gun Club presented Mr. and Mrs. Mathewson with a solid-silver tea set in recognition of the especial interest taken in the prosperity of the club and the advancement of the sport here under Mr. Mathewson's leadership and inspiration.

From the platform of the private car "Washoe" Mr. Mathewson on Oct. 16 waved au revoir to thousands of Anacondans who had gathered at the train to pay him a tribute that was a climax of the demonstrations in his honor.

The Actual Departure

He had been escorted from his residence to the train by the two bands, the business men and the school children in a long line of march. For everyone the honor paid was an expression of personal feeling. The members of the musical organizations had memories of the encouragement which Mr. Mathewson had given them from the first and the interest he has taken, especially in the concerts on the common during the summer and winter seasons alike. The schoolchildren were paying in part their debt of gratitude for the benefits realized from the playgrounds, institutions that constitute some of the many good works accomplished by him in his activity for Anaconda, and the business men felt that their presence would acknowledge in some degree what has been done to make the city busy, active and prosperous.

On both sides of Main St. the crowds had gathered in deep lines. The people followed the car to the depot, and as it stopped beside the train, they gathered around it for the words of farewell. The space between the station buildings and the park was packed by 6,000 or 7,000 people who had joined in the most spontaneous demonstration ever given in Anaconda. Mr. Mathewson was at a loss for words to respond, for the scene had fairly overwhelmed him. At last he spoke but briefly, though effectively: "I have always known Anaconda is the best place on earth," he said, "but not till today did I ever realize how good it is. For myself and my family I want to say that we have spent the happiest years of our lives here, in the best place where we have ever lived. And if anybody from Anaconda ever comes our way, the door will always be open; there'll not even be a latchstring to bother about pulling. I will not say good-by, for all of us will come back to visit Anaconda as often as it is possible. So the word will be only au revoir, and thank you for the outpouring in the name of friendship."

From the automobile to the train progress was checked by the large crowd of people assembled, and then the lines moved closer to the rear platform of the car, where Mr. and Mrs. Mathewson and their children stood until the train disappeared from view.

Copper Smelting at Naltagua in Central Chile

By Mark R. Lamb*

SYNOPSIS—Owing to uncertain supply and high price of coke, the blast furnaces at Naltagua will be superseded to a great extent by reverberatory smelting. The French company operating there has decided to install two reverberatory furnaces arranged for coal-dust firing; capacity is to be provided for crushing all ores so that they may be smelted in the reverberatories when this method is most economical.

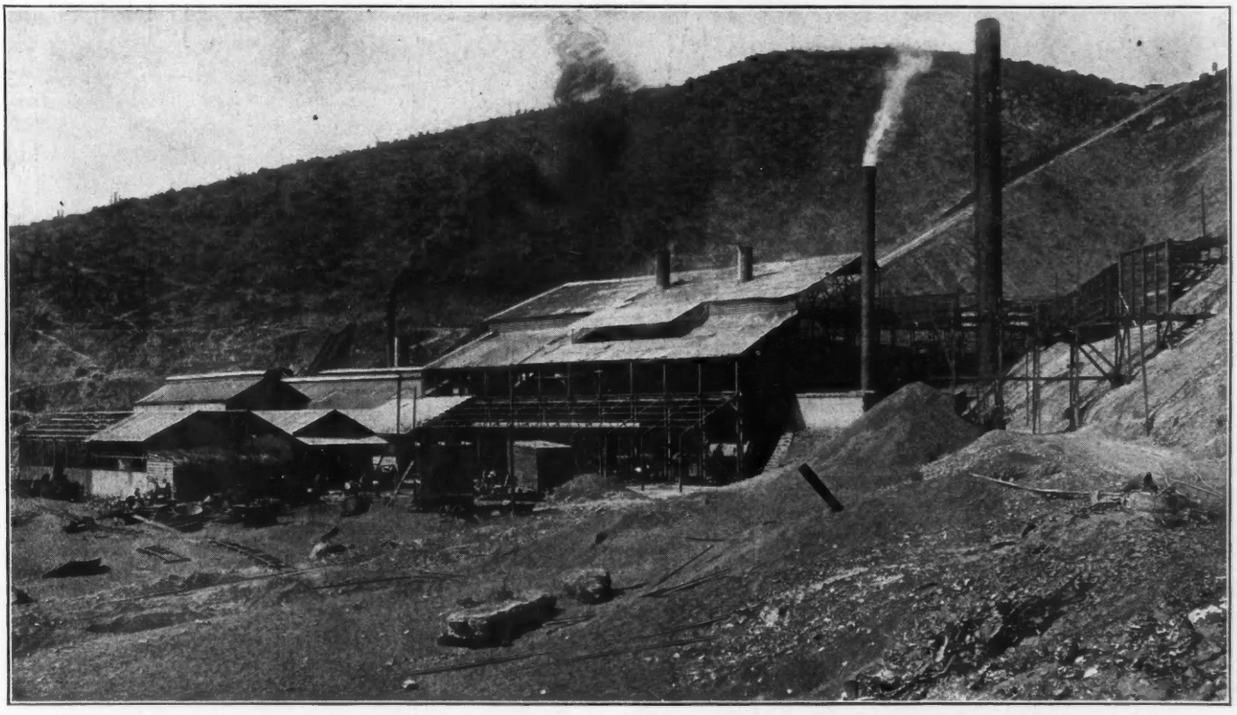
The French company, Société des Mines de Cuivre de Naltagua, has been operating a number of years at its mines near El Monte, Chile, about one hour by train from Santiago.

The ores of the company mines are short of the sulphur necessary for obtaining a suitable matte fall, and this condition has forced the company into purchasing sulphide ores. It is the desire of the smelter superintendent to burn off as little sulphur as possible and to make as high-grade a matte as can be converted satisfactorily in the basic converters.

Some of the company ores, as well as some of the purchased ores, consist largely of fines, and this has been one of the problems that have lately been solved by the purchase of two reverberatory furnaces to use coal-dust firing. The coke and coal market in Chile has been extremely variable and a source of much worry to the smelters, coke having reached prohibitive prices and at times being unobtainable at any price. At present the supply as well as the price has improved from the point of view of the buyer.

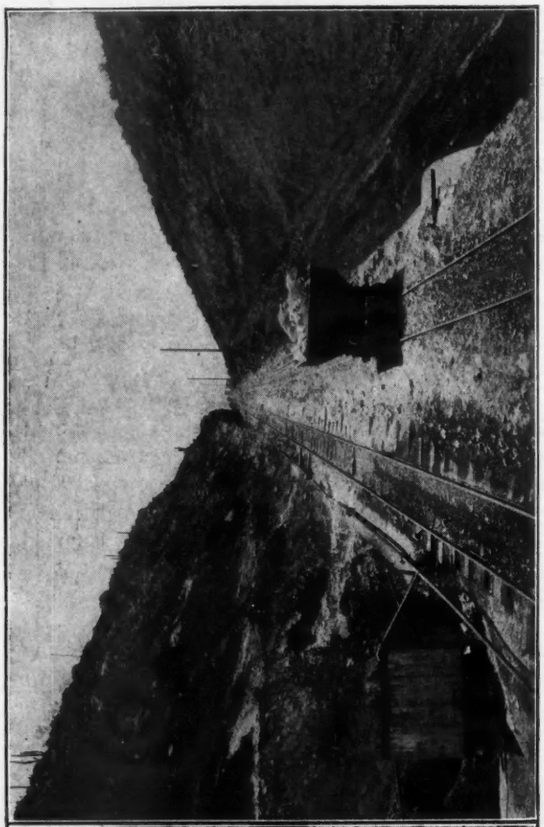
Coal, though produced in the country and of good quality, cannot be obtained in sufficient quantities to meet Chilean requirements. This is entirely due to lack of modern mining equipments, as the coal seams are thick and easily mined and are practically at the seacoast, near transportation. Before the Chilean mines are properly equipped, it is likely that the transportation situation will be normalized sufficiently to permit competition of American coal. Already the price of coal has dropped, and it is likely to go lower, as the ships that come out for nitrate must come in ballast or bring some such freight as coal.

The Naltagua company, as well as its sister company, Catémou, has made a long-term contract for fine coal, for which there is little demand in Chile. This fine coal will be delivered at El Monte in railroad cars and sent thence in an aërial tramway to the terminus of a short steam railway which takes all such materials as coal, purchased ore and supplies directly to the smeltery, and returns with bar copper for export. The coal will be discharged into bins, whence it will be drawn through a rotary drier, to be then crushed in a "pulverator" and finally pulverized in a tube mill. Small quantities of this pulverized coal will be stored over the firing end of the reverberatory furnaces. A noteworthy feature of the installation is that the coal drier itself will be coal-dust fired.

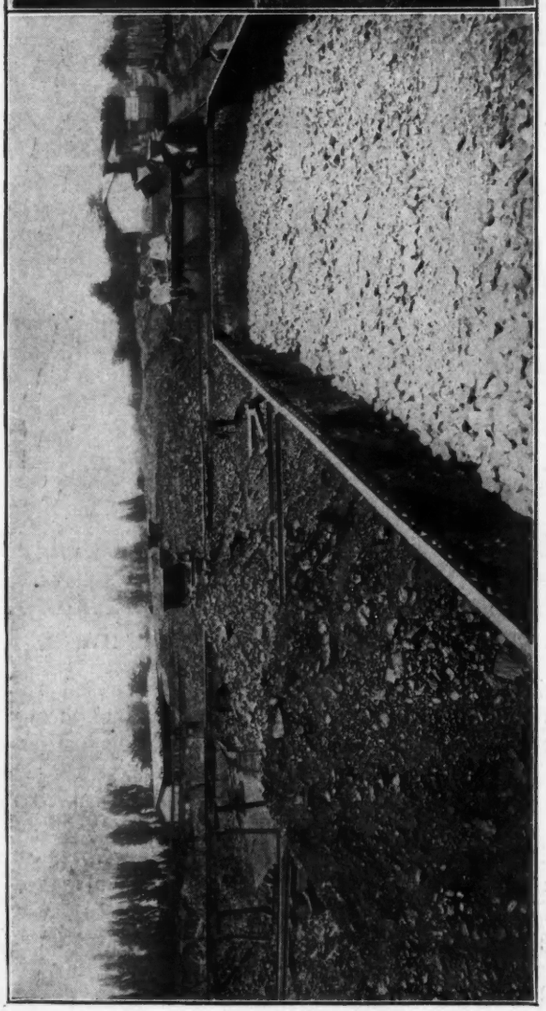


COPPER SMELTING WORKS OF THE SOCIÉTÉ DES MINES DE CUIVRE DE NALTAGUA IN CENTRAL CHILE

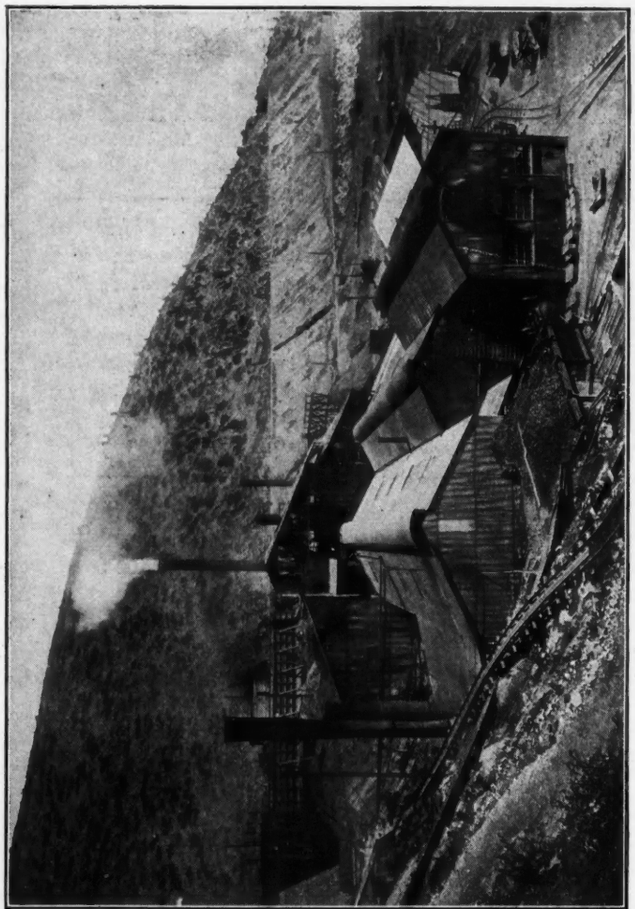
*Mining engineer, manager in South America for Allis-Chalmers Manufacturing Co., Santiago, Chile.



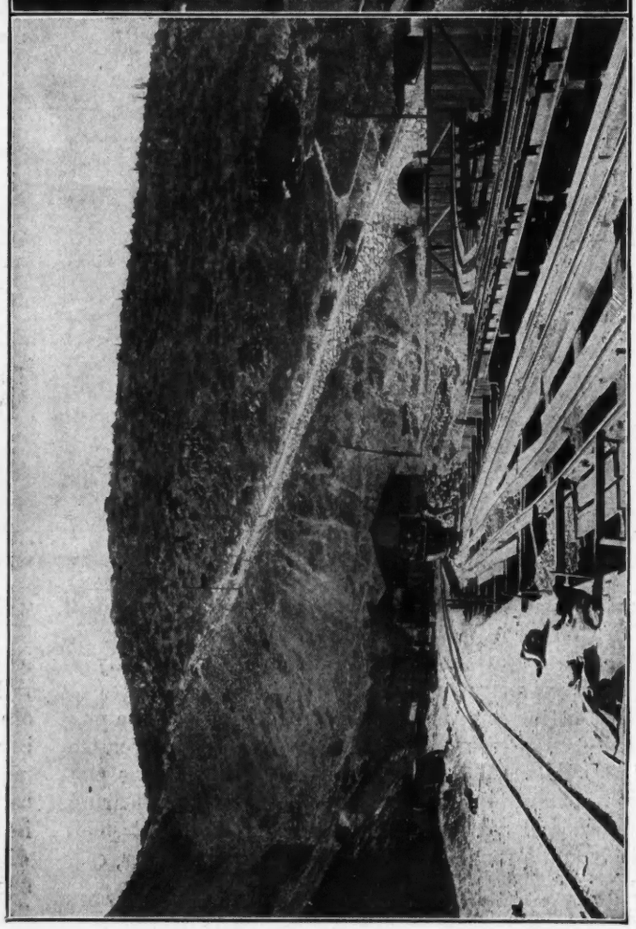
GRAVITY INCLINE TO SMELTING WORKS



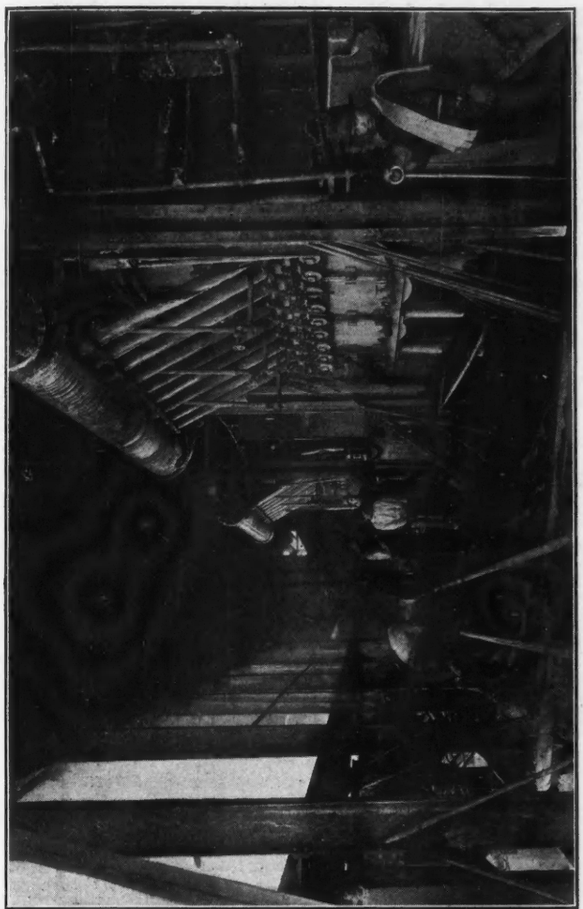
COKE AND ORE STORAGE AT EL MONTE

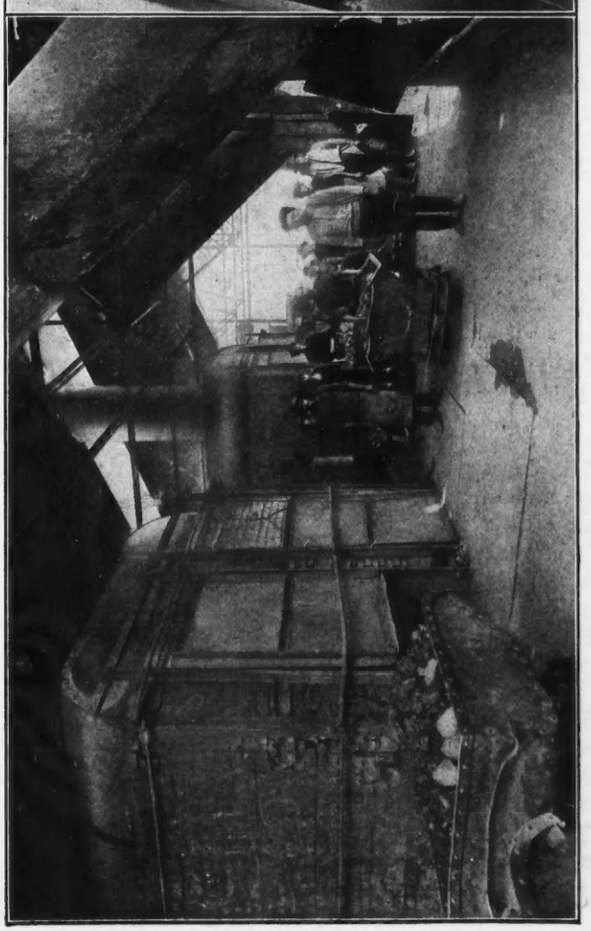


SIDE VIEW OF NALTAGUA SMELTING PLANT

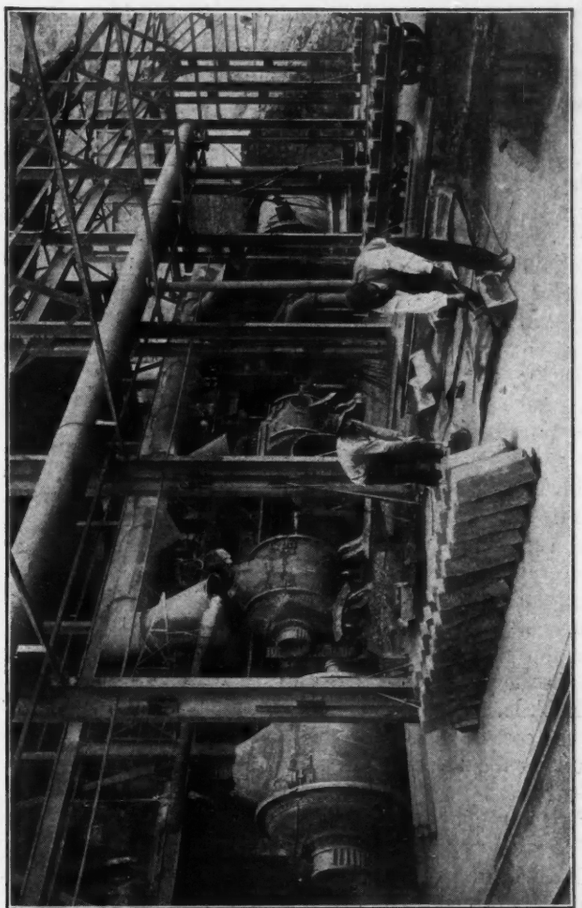


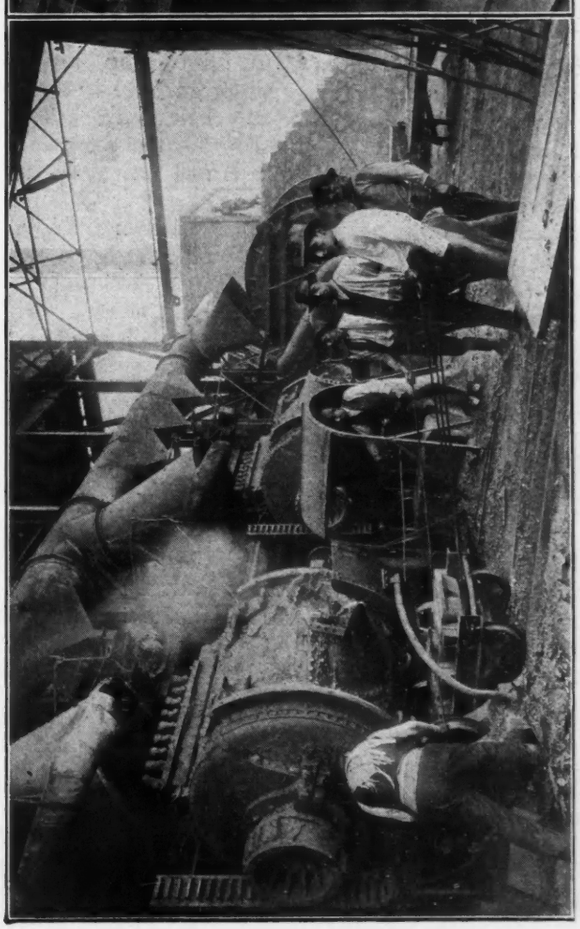
STORAGE BINS AT WORKS





FEED AND TAPPING FLOORS OF THE TWO 40x120-IN. BLAST FURNACES—REVERBERATORIES NOW BEING ADDED





THE CONVERTING PLANT OF THE NALTAGUA SMELTING WORKS IN CENTRAL CHILE—NOW USES BASIC LINING

The installation of these reverberatories provides a flexibility of operation that will result in important savings in operating expense. For example, when coke is high-priced, the reverberatories can be fed with a larger percentage of coarse ores, which, though more difficult to fuse, will be smelted more cheaply with low-priced coal in the reverberatories than with coke in the blast furnaces. When the conditions of fuel prices are reversed, the coarser ore will be sent to the two 40x120-in. water-jacket furnaces and only the fines to the reverberatories. Waste-heat boilers following the reverberatories will provide about 300 hp., which is half the present consumption, and as power at present costs them nearly 3c. per hp.-hr., the saving will be important.

A good smelting mixture is obtained, because of the large offerings of ores from which the company can choose, and it is expected that a fuel ratio of 7 : 1 will be attained. The ores will be dried, as at times they arrive saturated, and it is figured that the evaporation of this water can be done more cheaply in a drier than in the reverberatory itself. At first the ores will not be crushed finer than 2-in. ring, but provision is made for crushing all ores fine enough for smelting in the reverberatories when the prices of coal and coke warrant it.

With the influx of American capital that has begun to reach Chile, there is going to be a keen rivalry for labor, and the cost of this is certain to rise. All the companies are taking the necessary steps to retain their present labor and attract the additional men required. This refers not only to common labor, but to the technical men on the staffs of the various companies, because men go where conditions are most agreeable. When the Anaconda plant at Potrerillos and Mr. Braden's new venture at Aguirre are in full swing, there is going to be a hard fight for labor, and the company that is broad-gage enough to build up an attractive camp is not going to be short of people. The Naltagua company has always had a good supply of labor; as quarters for the men and living expenses are low, the biograph and various sports serve to clinch the argument.

Copper from Chile now goes to the States exclusively, and this is resulting in the appearance of dollar exchange. I received yesterday, for the first time, a check on the Banco de Chile drawn in dollars and am advised that it has just been made possible to open a dollar account in that bank. This is a long step forward.

Platinum Production in 1915

The production of refined platinum in the United States was 8,665 troy oz., according to statistics compiled by J. M. Hill, of the United States Geological Survey. California and Oregon produced 741.91 oz., valued at $23,500, an increase of 171.91 oz. over 1914 production. Most of this came from California, the Oregon production being from only one mine. The Rambler mine, in Albany County, Wyoming, produced platinum-bearing copper concentrates. The world's production is estimated as 143,145 oz., of which Russia yielded 124,000 oz., Colombia, 18,000 oz.; United States, 742 oz.; New South Wales and Tasmania (the latter producing osmiridium), 303 oz., and Canada, 100 ounces.

The figures on the recovery of platinum and allied metals by metal refiners are not complete and are probably several hundred ounces below the actual production. They are given as follows: Platinum, 6,495 oz.; iridium, 274; iridosmine-osmiridium, 355; palladium, 1,541; as compared with 3,340, 64, 195 and 2,635 oz. respectively for 1914. Of the 8,665 oz. of refined new metals recovered, 1,587 oz. is believed to be of domestic origin.

An interesting feature of United States Mint practice in 1915 was the melting and spinning of platinum for use in Government laboratories. Since the law does not permit the payment for other than gold and silver contents of bullion, the rare metals derived from the modern electrolytic-refining process might be described colloquially as "velvet." In rare cases, where it is evident that a deposit of bullion contains platinum, the depositor is so informed and is at liberty to withdraw his deposit.

Potash in Salduro Salt Deposit*

By Hoyt S. Gale†

The salt deposit at Salduro, Utah, is described in the railway pamphlets as one of the scenic wonders of the Western Pacific R.R. route west of Salt Lake City. The name is that given to a small station and sidetrack established by this railroad 112 mi. from Salt Lake City on the main line westward, only a few miles east of the Nevada State line. It lies in the center of a broad, flat plain of glistening white salt, so smooth and hard on its surface that the place has been used as a track for automobile races by people from Salt Lake. The station has been the site of a small salt industry since the Western Pacific R.R. was completed and has lately attracted attention as a possible center of production of potash salts. Wendover, a freight terminal of the railroad, 9 mi. farther west, is a small settlement at which railroad hotel accommodations are available to travelers or visitors and from which the Salduro deposit may be easily reached by wagon.

The Salduro deposit has for some time been of local interest as a remarkable deposit of clean, pure-looking salt, especially as it lies immediately on the route of a main line of railway. The property has been covered by a group of claims owned largely by persons or companies in Salt Lake and Ogden, and the deposit has been more or less exploited by the Montello Salt Co., of Ogden, and later under lease by the Capell Salt Co., of Salt Lake City, as a source of salt.

Area More Than 100 Square Miles

The deposit consists of a smooth white bed of solid crystalline salt that extends from east to west along both sides of the railroad from a point near milepost 811 (Salduro station is 815) to and considerably beyond milepost 818, a total distance of about 8 mi. According to reports the deposit covers more than 100 sq.mi. The salt forms a surface crust that is from 3 to 5 ft. thick in its thickest part, near the center, and thins off gradually toward the edges.

Naturally this deposit was one of the first to attract attention as a possible source of potash when, in 1911, after wide interest in potash had been created, the West was explored generally for deposits of potash salts.

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†Geologist, United States Geological Survey, Washington, D. C.

Reports of tests for potash made on the Salduro salt and associated brines were considered unfavorable, however, and interest in the deposit was confined to visits and sampling by private parties, who apparently all reached the same conclusion. I visited the deposit for the United States Geological Survey in the course of my regular field work in October, 1914, when I bored three shallow holes with a hand auger and took the samples here described. The analyses were made by R. K. Bailey in the Survey laboratory at Washington in November and December, 1914.

SAMPLES FROM HOLE NO. 1

[Site: ¼ mi. due south of Salduro (railroad signboard), on Western Pacific R.R.]

	Depth in Feet
Salt, hard (total thickness of the salt stratum here)	0 – 3.3
Clay, sticky saline (= sample No. 1 at top) somewhat mixed with broken salt crystals from overlying stratum (= sample 4 at depth 8.9 ft. and sample 5 at depth 12 to 12.2 ft.)	3.3–12.2

Brine from a depth of about three feet was collected from this hole after five minutes' pumping with a small hand pump and saved as samples 2 and 3 (duplicates).

SAMPLES FROM HOLE NO. 2

[Site: 1 mi. by measurement S 39° E from hole No. 1.]

	Depth in Feet
Salt, white crystalline, with some gray, muddy (= sample 6)	0 – 0.8
Salt, including muddy portions, to base of surface, salt stratum here (sample 7 is of cuttings from 0.8- to 3.2-ft. depths)	0.8– 3.2
Clay, gray, sticky, somewhat mixed with broken salt fragments from above	3.2– 4.2
Clay, as above (= sample 8)	4.2– 7.7
Clay, white to gray, but including hard, knotty portions of tufa-like material (= sample 9)	7.7–10.2
Clay, white, plastic	10.2–12.0

Brine from a depth of about three feet was collected from this hole after pumping and was saved as samples 10 and 11 (duplicates).

The brine in hole No. 2 stood 3½ in. below the surface level and, as in hole No. 1, flowed freely on pumping. In the course of the pumping a clean sand-like deposit came up with the solution and settled out in considerable quantity. It appears to consist of small, clearly defined crystals of gypsum.

At hole No. 3, near the old salt camp, just east of a small gasoline storage house which stood south of the set of three houses of the salt camp, the crust was very hard to drill, and the hole was not completed. Sample 12, taken here, was brine that flowed into this hole when it was 37 in. deep, before the salt crust had been entirely penetrated.

Thickness of Salt Deposit Three to Five Feet

The borings show that the crust near the center of the deposit is a surface layer of salt that reaches in places a thickness of 3.2 ft. Test borings at other places are reported to have shown a thickness of 5 ft. or more. The crust is underlain by a smooth white clay, and both salt and clay are permeated by a saturated brine, which in certain places flows freely.

Tests of the weight of the salt crust had been made by E. G. Rogers, who was for a time in charge of the work of extracting and shipping the crude salt from this deposit. By actually weighing a block measuring a cubic foot he found that 90 lb. might be taken as an average from which to estimate the quantity of salt available.

The analyses of the samples already described are given in the following tables:

The composition of the salt crust is shown by samples 6 and 7. Sample 6 was taken from the purer surface layer, 10 in. thick, and sample 7 was somewhat muddy salt taken from depths of 10 to 38 in.

Sample 6 is therefore a comparatively pure sodium chloride containing 95.39% NaCl, apparently no Na_2SO_4 and 4.08% $CaSO_4$ in the water-soluble part. Doubtless the insoluble portion was partly gypsum and partly mud.

The soluble salts contained in the underlying layers are shown by the following analyses of test samples:

ANALYSES OF SAMPLES OF LOWER LAYERS AT SALDURO SALT MARSH

As Percentages of the Soluble Salts

	Hole No. 1			Hole No. 2	
	Sample 1, at Top of Salt Crust	Sample 4, at Depth of 8 to 9 Ft.	Sample 5, at Depth of of 12 Ft.	Sample 8, at Depth of 4 to 8 Ft.	Sample 9, at Depth of 8 to 10 Ft.
K	2.25	2.64	1.82	2.36	3.48
Na	....	....	....	....	....
Ca	....	....	....	....	....
Mg	....	....	....	....	....
Cl	47.77	55.84	54.27	49.65	56.67
SO_4	13.86	3.65	5.41	13.14	3.55
CO_3	None	None	None	None	None
HCO_2	None	None	None	None	None

ANALYSES OF SAMPLES OF LOWER LAYERS AT SALDURO SALT MARSH

As Percentages of Original Sample

	Sample 1	Sample 4	Sample 5	Sample 8	Sample 9
Total soluble salts ignited	14.55	13.00	13.98	15.36	11.72
H_2O in original sample	6.01	5.79	5.12	5.93	6.75

The content of potassium in the salts in these muds is considerably higher than that in the purer salts, which are free of mud. The analyses therefore show the absorption of potash by clay, which is more clearly shown by detailed work done on the muds of Columbus Marsh,

SOLUBLE PORTION, IN PERCENTAGES, OF SAMPLES 6 AND 7

	Sample 6	Sample 7
K	0.07	0.25
Na	36.85	33.30
Ca	1.20	4.72
Mg	0.10	0.21
Cl	58.90	50.51
SO_4	2.88	11.01
CO_3	None	None
	100.00	100.00
Total soluble salts (ignited)	96.20	52.22

and here, as there, it seems extremely doubtful whether any commercial importance can be attached to the small percentage of potash salts found particularly as they are mixed with a heavy plastic mud which would be extremely difficult to handle.

ANALYSES OF BRINES FROM SALDURO SALT MARSH

As Percentage of the Dissolved Salts

	Hole No. 1, Sample 2	Hole No. 2, Sample 11	Hole No. 3, Sample 12
K	3.18	4.01	2.85
Na	33.78	Not determined	Not determined
Ca	0.30		
Mg	1.70		
Cl	59.60		
SO_4	1.44		
	100.00		
As Percentage of the Original Sample			
Total soluble salts ignited	26.78	25.68	26.85
Specific gravity	1.211	1.206	1.211

The potassium content of the samples of brine ranges from 2.85% to 4% of the dissolved salts, or 0.76% to 1.03% of potassium in the original solution, which is saturated with this and other salts. This is about one-half the potassium content of the Searles Lake brine (analyses show 2.07 to 2.17% potassium in the original solution at Searles) but double the potash content of the water of Great Salt Lake (0.34% potassium in the sample of October, 1913), which, however, is not usually a saturated solution.

If, as has been reported, potash can be successfully recovered from the waters of Great Salt Lake, either as a byproduct or directly as a principal product under present market conditions, it is of course possible that the Salduro brine and many other brines of the Western desert basin regions might also be worked. Though there is undoubtedly a great quantity of brine in the area at

Salduro, yet it does not, as at Searles Lake, constitute so large a part of the saline deposit, and as the salts at Salduro are so much shallower and the underlying clays so much less permeable to water solutions, the total quantity available must be correspondingly smaller.

Manganese Ores of Bukowina*

The author visited the manganese-ore deposits of the Dorna Vatra district of Bukowina province, Austria-Hungary, toward the close of 1913. The orebodies are situated on the slopes of the Carpathian Mountains, near the Roumanian frontier. The principal deposit is that of Arschitza, 3 km. to the southeast of the village of Jacobeni. Others, known as Orata, Oitza, Kilibaba, Putchos and Valaputna, occur to the north of Jacobeni; and Theresa, Rosch and Sara Dorna lie to the south, near the Roumanian frontier.

The district is well wooded and mountainous, and from 800 to 1,300 m. above sea level. Highways are excellent, and the district is connected with the Austrian steel works by a standard-gage railroad to Hatna, where it joins the main line between Lemberg, Czernowitz and Bucharest.

The ore occurs chiefly in silicious mica schists, in lenticular bodies of oxides of manganese and iron up to 100 m. long and 40 m. wide. The general direction of strike is northwest to southeast, and the dip varies from 20° to 50°. At Arschitza and Argestru, near Jacobeni, three principal lenses had been developed. The deposit consists of a mixture of pyrolusite, some hausmannite, brown hematite and quartz. The combination is called *Schwarzeisenstein* (black ironstone.) At Oitza the deposit is built up of beds 0.1 to 2 m. thick of grayish green to flesh-colored rhodonite with interspersed portions of rose-colored manganese spar (rhodochrosite?) and quartz and layers of a yellowish green mica hornblende schist. A piece of mineral from the lower levels at Arschitza and of the type locally known as rhodonite proved on analysis to consist essentially of the carbonate rhodochrosite. Analyses of some samples taken at Arschitza show the manganese to vary from 33 to 39%; iron, 8 to 14%; silica, 12 to 22%; phosphorus, 0.3 to 0.5%. After deduction for mineral already excavated and assuming that only 25% of what remains may be merchantable ore, it is calculated that over 150,000 tons of mineral could be mined above the 100-m. level in the Arschitza deposit; giving an output of 50,000 tons per annum for three years without taking into account the quantities of oxide and carbonate which could be proved at lower levels.

Early mining operations were conducted by opencut. Then crosscuts were run from the surface to the orebody, and the mineral was extracted without any prearranged plan or regular filling. Later, overhand stoping was introduced and was in use at Arschitza in 1913. Crosscuts were driven into the mountain side at vertical intervals of 30 m. or less, and ore extracted by making rooms to a height of 2.5 m. in parts of the orebody containing merchantable ore. Low-grade ore was used for filling, through which timbered raises were carried and successive slices of the mineral were extracted. The average cost of mining for seven years had been about $1.90 per ton.

The ore-dressing plant, 1¼ km. north of Jacobeni station, was operated by power from the river Bistritz. The equipment consisted of rolls, trommels and jigs, one section operating on fines and the other on lumpy material. The average cost of washing the ore, from 1906 to 1912 inclusive, appeared to be 1.5 kr. (about 30c.) per ton of run of mine.

The average of official analyses of mine product showed dry ore to contain 30.30% Mn and 0.34% P. Two principal grades of washed product were obtained, carrying 44.8% and 41.90% Mn respectively; the average of analyses showing 42.90% Mn, 12.06% Fe, 7.20% SiO_2, and 0.41% P. The daily output of these two grades was 42 tons, or 35% of the total rock handled, and the balance consisted of 45 tons of "manganese waste" carrying about 27.90% Mn, 23 tons of "manganese mud" carrying about 28.2% Mn and 10 tons of discarded waste; everything but the latter was sold. In 1913 the average cost of product was $2.62 per ton. The average selling price was $2.21, showing a loss of 41c. per ton.

The deposits, while perhaps of no great importance in normal times, are believed to have been of great value to Austrian steel works from the time the Russian troops were forced out of the Bukowina until June, 1916, when that province was again occupied by the Russians.

*Abstract of paper by Herbert K. Scott, Iron and Steel Institute, London, Sept. 21-22, 1916.

Safety-First Medals Plus Cash Bonuses

The Joseph A. Holmes Safety Association, organized to perpetuate the memory of the late director of the United States Bureau of Mines, has evolved a plan that should yield some quick and valuable results. It has resolved:

1. That annually there be awarded one or more medals, with honorariums, to be known as the Holmes Award for the encouragement of those originating, developing and installing the most efficient safety-first devices, appliances or methods in the mineral industry during the previous year. These awards to be the result of reports and investigations by the secretary and the representatives of the association.

2. That once a year a meeting will be held in the City of Washington at which these awards will be made and to which the recipients will be invited, the awards being announced publicly at a dinner or meeting which may be held at the time of the annual meeting of the representatives of the societies making up this association.

3. That the executive committee, at its discretion, may make awards of suitable medals for personal heroism or distinguished service or the saving of life in any branch of the mineral industry, such medals being of small intrinsic value, but suitably inscribed with the name of the recipient and the nature of his service. These medals to be presented publicly, with appropriate ceremonies, through the medium of the field representatives of the Bureau of Mines or other suitable agency at the mining camp, town, village or city nearest the mine, smeltery or other establishment in which the act of heroism or service was performed.

Like all good works that require the expenditure of money, this movement will be limited only by the extent of the generosity of the public. More than 20 national societies, labor organizations and Government bureaus are represented in this association; but subscription blanks may be obtained from the secretary of the Joseph A. Holmes Safety Association at Washington.

Sheet Mica Production in 1915, according to the U. S. Geological Survey, was less in quantity than in any of the 12 preceding years, but the value is the highest recorded. The average price per lb. was 68c., as compared with 50c. in 1914, 21c. in 1913, and 11c. in 1910. The total value of all mica, sheet and scrap, produced in the United States in 1915 was $428,769; exceeded only in 1913, when the value was $436,060. Of the 553,821 lb. of rough-trimmed and cut mica produced, North Carolina supplied 281,074 lb. or about 51%; and of the 3,959 tons of scrap mica, 2,840 tons, or about 72% came from North Carolina. The remainder of the production was from New Hampshire and eight states of less importance.

Rich Gold Ore Found in Idaho

By Robert N. Bell*

SYNOPSIS—The finding of bonanza gold ore in the working of the Boise-Rochester company and the solution of the metallurgical difficulties of the Altanta Mines Co. have brought Idaho gold mining into greater prominence. The metallurgical accomplishments, while not so sensational, are more conducive to the permanence of the district as a gold producer. Amalgamation recovers 25% of the gold. Concentration, roasting and leaching bring the final recovery to 92%, which gives a good profit on the ore available. Of the silver content, 70% is recovered.

The recent gold-ore discoveries made on the property of the Boise-Rochester Mining Co., in the Atlanta district, 80 mi. east of Boise City on the middle fork of the Boise River, are of unusual interest by reason of the high contents of the ore disclosed and the environments in which it has been found.

Other developments and advancements of the past year in the Atlanta Mining district, however, especially in the matter of ore treatment, are of more real importance than the bonanza ore, which, while of a sensational nature and fully confirming the romantic stories of the early-day production of rich ore from this district, as far as is now known may only be of transitory interest; but the milling-ore development and the ore-treatment demonstrations recently made practically insure that an old gold camp can come back, and in this instance, I believe, remain as an important gold producer of considerable capacity.

The geology of the Atlanta district is covered in an old bulletin entitled "A Geological Reconnaissance Across Idaho," by George H. Eldridge, which was published in the Sixteenth Annual Report of the United States Geological Survey. As stated, this district is 80 mi. east of Boise and about the same distance northeast of Mountainhome, both on the Oregon Short Line Ry., and is connected with both points by good wagon roads over which daily auto stages and light motor trucks serve the district. This road, via the noted old gold camp of Rocky Bar, crosses a high divide at an elevation of 8,000 ft. and is closed to vehicular travel for nearly six months of the year. The Boise River road from Boise City by way of Arrow Rock Dam, is only passable for light rigs, but is on a water grade all the way and would make the camp much more accessible with improved wagon road construction.

Developments on the Atlanta Lode

Atlanta is situated well within the great eruptive granite batholith of central Idaho, 40 or 50 mi. from its nearest contact lines of overlying ancient sedimentary formation. The entire surrounding region is siliceous gray granite or quartz monzonite extensively intruded by dikes of igenous rocks up to 200 ft. in width, including fine to coarsely crystalline quartz porphyry and quartz-bearing syenite porphyry, together with some smaller dikes of greenish-black diabase rock. The central feature of the district's mineralization is the great Atlanta lode, which has been compared in power and persistency, by some of the older authorities, with the Comstock Lode and other noted ore courses of the west.

This lode starts at what I believe to be a persistent north-south fault marked by the course of Montezuma Gulch and a line of mountain saddles. It strikes S 70° W, is nearly vertical with a dip of 10 to 15° to the southeast. This lode is entirely covered at the surface with disintegrated granite débris except for a segment of about 1,000 ft. on the point of the highest apex. It forms the axis of Atlanta Mountain, a terminal spur of the Sawtooth Range, two miles distant and about 2,000 ft. vertically above the town of Atlanta, which is situated on the middle Boise River at an elevation of 5,500 ft.

From Montezuma Gulch the lode has been opened at short intervals along its course for 2½ mi. to the Yuba River, beyond which its course has not been determined. For ¾ mi. along the course of this great lode it has been extensively stoped, drifted and developed. The deepest point of penetration is on the Monarch mine, which consists of a vertical shaft 600 ft. deep with six well-developed levels, the bottom east level having a face depth of approximately 1,000 ft. under the highest crest of the lode. The lode is a strong fault fissure from 50 to 150 ft. thick between well-defined talc gouge walls, slickensided and deeply grooved in several directions. Its matrix consists of a severely crushed and brecciated granitic gangue and in the limited outcrop exposed shows an irregular stockwork of crystalline quartz seams with wall bands varying from 5 to 20 ft. thick of decidedly shattered bluish quartz. The blue color is due to the presence of finely disseminated ruby silver and mixed sulphide minerals including iron, lead, zinc, copper, antimony, arsenic, argentite and native metals of both gold and silver very finely divided and affording a concentrate representing about 2% of the volume of the ore.

This lode was made famous in the late 60's by the shipment of crude silver-gold ore which the old smelter-return record books show ranged from $800 to $1,000 per ton. These high results were largely due to secondary silver minerals and were principally derived from the shallower levels of the Buffalo and Monarch mines, with smaller shipments from the Pettit, Last Chance, Minerva, Big Lode and Tahoma mines.

The Vein System at Boise-Rochester

Striking across the Atlanta lode with a course N 70° W, there exists a close-set system of steep parallel fissures along which the Big Lode, Tahoma, Last Chance and Minerva mines were the most important producers. This subsidiary system of closely parallel veins at almost 300-ft. intervals contains some good values, but the ore-bodies are less persistent with two or three exceptions than in the main lode. They give the general appearance of being older than the lode and are probably faulted by it, but that feature is not fully determined.

An extremely interesting phase of the mineralization, on the main lode in its deepest workings on the Monarch mine, is the persistent occurrence of a small black dike of diabase accompanying the main ore course, which is built on both walls of the dike and gives the appearance

*State mine inspector, Boise, Idaho.

of being later than the black-dike intrusion which may have been the germinating cause of the ore occurrence, as I have pointed out in several other important instances in Idaho mine development. A similar small basic dike has recently been disclosed in the best lower level stopes of the Boise-Rochester company.

The deepest development on the main-lode ore course still shows occasional patches of high-grade ore. The ore upon which an important tonnage can be figured is of about $10 per ton value and shows a decided increase of gold in proportion to silver as depth is attained, having a present ratio on the Monarch development of about three-fourths gold and one-fourth silver in the total contents. Toward the east end of the lode the ratio of gold to silver on the Boise-Rochester property has always been higher and will average 9 to 1.

The entire length of the main lode as originally outlined is covered by the patented properties of the Boise-Rochester Mining Co., the Atlanta Mines Co. and the Atlanta Gold and Silver Mining Co.

Bonanza Ore Development at Boise-Rochester

The Boise-Rochester Mining Co.'s property extends from the east end line of the old Monarch group for 2,700 ft. to Montezuma Gulch, where the lode is believed to be abruptly terminated on a big fault, as the texture of the granite northeast of this gulch is entirely different and other topographical features indicate a fault at this point. This property represents a reorganization of the Bagdad-Chase company holdings. This latter company was a former extensive operator in San Bernardino County, Calif., and about ten years ago purchased the Pettit group of claims, which at that time had an extensive development of $10 ore aggregating about $1,000,000 in gross value at the extreme western end of the group adjoining the Monarch showings.

The property was equipped with a 40-stamp mill and an aërial tramway one mile long. The ore proved decidedly difficult to treat, as only half of its content was amenable to plate amalgamation and the methods then in vogue, of concentration and cyaniding the concentrates, gave decidedly unsatisfactory results. The enterprise failed to pay a profit and was shut down several years ago and left in the hands of a caretaker. A little over a year ago a privately owned half-interest in the extreme east end claim was combined with the Bagdad-Chase property and a reorganization accomplished under the present name.

As a result of the development by intelligent concentrated annual assessment work on these claims in the lowest adit tunnel at the east end of the group, an entirely new shoot of ore was discovered carrying excellent mineral that varied from $4 to $20 per ton and averaged around $12 per ton. The mill was overhauled, new motors installed, and put in operation to the extent of 20 stamps, and for the past year it has been treating about 100 tons of ore a day from this new shoot, which proved to be 500 ft. long and from 5 to 15 ft. wide. At a distance of 100 ft. above this lower adit, while stoping up on this orebody, a flat fault was encountered which displaced the ore course to the south at a horizon of about 10 ft. below another old crosscut adit higher up the mountain.

After recovering the vein above this fault displacement, it was found to contain some extremely high amounts of gold. It has now been drifted on for 300 ft. to a face depth of about 180 ft. and shows for that distance a practically continuous pay course of bonanza value that varies from a mere seam up to 10 in. thickness containing material of better than $1,000 a ton in gold with selected hand specimens disclosing bands of native metal as much as ½ in. thick. The vein on this level varies up to 15 ft. in width of talcy granitic gangue with irregular black bands of gouge material, a subordinate quantity of crushed quartz and occasional segregations of calcite crystals and siderite crystals, the latter a definite evidence of good gold values, and fortifies the belief of the origin of the minerals in a basic end phase of the granite magma.

The richest specimens are definitely associated at this point on the lode with a soft greasy looking noncrystalline black mineral that was thought to be petzite, a telluride of gold and silver, but the company's assayer found no reaction for tellurium and a more detailed study of this particular mineral by A. G. Van Eman, a Boise chemist, has determined it to be a complex lead mineral, sulph-antimonide and sulph-arsenide of lead, containing fully 50% lead. It shows no crystal form, and it is interesting to note that some of the richest specimen ore occurs on a decided movement plane in the vein and is polished like a mirror as it comes out of the vein, the native gold occasionally showing through the polish in the black mineral. It is barely possible that this high-grade ore may be localized to a few feet above the horizontal fault in the vertical vein; however, it ranges along the vein from the portal of the new adit tunnel to a face depth of nearly 200 ft., and a narrow diagonal fissure a few inches thick containing $600 per ton is now being drifted on from the foot-wall side of the lode toward the course of this new ore channel at a point 400 ft. farther west on its strike and under the fault. These conditions combine to indicate considerable lineal extent and depth to this high-grade mineral, and from present appearances the discovery should result in the shipment of several carloads of bonanza ore besides affording a continuation to the surface of the large milling-ore shoot shown and of much better grade than previously handled.

The old Bagdad-Chase company had entirely lost faith in the enterprise, and the new developments and operations are to be credited to the faith of local operators and local capital and particularly to the present manager of the property, Leo J. Falk, a young business man of Boise, who was personally concerned in the original transfer of the property. The present company has carried on extensive experiments in an effort for better recovery of values by fine-grinding and cyaniding the concentrates raw at the milling operations, has made considerable progress along this line and is now experimenting with flotation under the direction of George J. Wyman, Jr.

The Atlanta Mines Co.

The most important advancement of the year in this district, exceeding in permanent value the rich ore disclosure on the Boise-Rochester property, has been made by the manager of the Atlanta Mines Co. This property embraces 2,200 ft. of the main lode to the west of the Boise-Rochester and includes the most important area of the old-time development and production of the district, when it was extensively mined under the separate enterprises known as the Monarch, Last Chance and Buffalo mining companies.

These properties were acquired and consolidated by T. N. Barnsdale, of Pittsburgh, Penn., during the Thunder Mountain boom of 14 years ago and have since been lavishly supplied with capital for mining, development and milling equipment. During these years the enterprise has been in charge of Daniel Kirby, an experienced Colorado mining operator who has developed a large amount of primary milling ore, estimated at fully 500,000 tons of about $10 a ton ore.

While developing the old mines to greater depth, Mr. Kirby has employed some of the best metallurgical talent available in several specific attempts to treat the ore on the ground, but has been unsuccessful beyond an extraction of 40 to 50% of the contents. These milling efforts embrace amalgamation, fine concentration and cyaniding, succeeding the old pan-process methods employed in the early days, which proved too expensive on the primary ores available. These efforts have resulted in the accumulation of a milling plant of 150 tons daily capacity which, within the past year, has been turned to excellent account by a local metallurgist, Marcus White, of Silver City, Idaho, who in conjunction with Mr. Kirby is now operating the property under lease on dump ores and making a big success in extracting the low-grade contents available.

Metallurgical Difficulties Overcome

On the various old shaft and tunnel dumps that represent the accumulation of low-grade ore from which the high-grade shipping and milling ore has been carefully picked, this property carries at the surface 200,000 tons of mineral which, on elaborate sampling tests, shows an average of between $4.50 and $5 per ton in gold and silver in a ratio of about ¾ gold to ¼ silver. This extensive resource of mined mineral is now being treated at the rate of 130 tons a day. It is taken from the various dumps by a system of gravity and dragline haulage to the main aërial tramway head, which connects with the mill on the Boise River two miles below and affords an average mill-feed value of $4.50 per ton.

The method employed is grinding the ore in four 5-ft. Huntington mills with a combined capacity of 120 tons a day. The pulp is discharged through 30-mesh screens onto copper-plate amalgamation tables which recover 25% of the contents as free gold. The mixed sulphides are then recovered on Johnson vanners at a ratio of about 60 tons into one and assay from $120 to $150 per ton in gold and silver. These concentrates are then roasted in an Edwards mechanical-rabble furnace 90 ft. long with a 7-ft. hearth, 3% salt is added for chloridizing the silver, and after a dead roast with cordwood fuel, the sulphur and arsenic contents are reduced to a small fraction of 1% and the roasted concentrates leached in an 8-lb. cyanide solution, resulting in an extraction of 92% of the gold and 70% of the silver in the concentrates, at a total cost, for this separate treatment, of $7 per ton of concentrates, or 11½c. per ton on the original mill feed. This is the most complete recovery of values that has ever been attained in the Atlanta district and at a lower cost and is a great credit to Mr. White's metallurgical ability in solving a serious problem of ore treatment that has stood as a bar to the profitable utilization of the extensive ore resources that the Atlanta lode mines have been known to contain for years. Given a modern crushing plant at the head of this mill, of the Hardinge or Marathon type, for fine grinding and flotation cells for closer concentrating work, which could be installed at a moderate cost, Mr. White believes he can increase the capacity of this plant to 300 tons per day and make a recovery of metal on the deep-level ore resources of the property similar to what is now being made on the low-grade dump material available, which is being handled at a handsome margin of profit at this time; and it seems likely, from present demonstrated results, that the Atlanta Mines Co. may be shortly transformed into one of the important gold producers of the west and that Mr. Kirby's and Mr. Barnsdale's faith in the deposits of the district will be amply justified with profit-sharing results.

The recent mining development on this property has been intelligently handled, with an elaborate system of daily sampling, mapped, disclosing bodies of mineral up to 40 ft. in thickness of $8 to $10 ore that gives manifest evidences of the basis of a big gold-producing operation of lasting character.

Secondary Metals in 1915

The quantities of metals recovered in 1915 from scrap metal, sweepings, skimmings and drosses have recently been reported upon by J. P. Dunlop, of the United States Geological Survey. His report gives the estimated production of secondary copper, zinc, lead, tin, antimony and aluminum, the total value of the recovery amounting to more than $114,000,000, exclusive of the value of old iron, steel, platinum, nickel, gold, silver and other metals. According to this report, it is not the large manufacturer, but the individual housekeeper and the small tradesman who are responsible for the opinion that the inhabitants of the United States are the most wasteful in the world. As an example of metal waste which appears small and unimportant, it is stated that probably not one-tenth of the tin or other foil made is ever re-used, though such foil can be made only from the purest metal.

In 1915 dealers, smelters and refiners handling waste metals were more prosperous than ever before. Many consumers, who formerly had always used virgin metals, found it necessary or advisable to buy scrap material. The result was an increased demand for the latter and also some improvement in methods of handling so as to obtain a higher grade of product.

Assuming that remelted brass had an average content of 70% copper, the total recovery of secondary copper was 196,187 tons, of which 29,787 tons was recovered by plants refining primary metals and the balance by plants treating only secondary materials.

The reports show that the railways utilized in their own shops and foundries more than 13,000 tons of brass, in addition to 850 tons of copper and 4,750 tons of copper in alloys other than brass.

Secondary lead recovered in 1915 amounted to 78,900 tons. The total increase over 1914 was about 17,800 tons, and that of lead in alloys more than 10,700 tons, the increase being ascribed to expansion in railroad traffic and manufacturing.

Secondary zinc, including that in brass, amounted to 92,575 tons in 1915, being equal to 19% of the production of primary spelter in the United States.

Secondary-antimony production increased from 2,646 short tons in 1914 to 3,102 tons in 1915, all but two tons being recovered in alloys.

Secondary tin recovered in 1915 was equal to about 24% of imports as metal or oxide, being 13,650 tons as compared with 12,447 tons in 1914. The metal recovered as tin was 5,250 tons and that in alloys and chemical compounds, 8,400 tons. The latter includes the tin content of products made from clean tinplate scrap, consisting mainly of tin chloride with some oxide, etc.

Secondary-aluminum recovery in 1915 amounted to 8,500 tons, as compared with 4,522 tons in 1914. Of this 2,800 tons was recovered in alloys, mainly of 92% aluminum and 8% copper. The increase in quantity of secondary aluminum in 1915 is said to be due to the use of old castings in automobile manufacture.

Recent Labor Legislation

Walker D. Hines, chairman and general counsel of the Atchison, Topeka & Santa Fe Railroad Co., addressed the annual convention of the Investment Bankers' Association of America, Oct. 4, on "The Needs and the Opportunity of the Railroad Situation." In this address he gave an excellent and concise summary of recent events and legislation that have led up to the present dangerous situation in the economics of the United States. Mr. Hines said:

In July, 1914, the locomotive engineers in the territory west of Chicago and the Mississippi River made demands for increased wages and more favorable working conditions. The railroad companies made counter demands for the modification of various working conditions which they regarded as unreasonably favorable to the engineers. The railroad companies offered to submit both sets of demands to arbitration under an act of Congress which had been passed the year before with the approval of the railroad brotherhoods. The engineers refused to arbitrate the demands made by the railroad companies and said they would strike unless the arbitration was confined to their own demands. President Wilson intervened and urged the railroad companies to avert a strike by confining the arbitration to the points which the engineers were willing to arbitrate. The railroad companies, out of deference to the President, yielded to this unreasonable position. Here the country was face to face with a railroad strike which threatened to tie up transportation throughout the West; the arbitrary position of the railroad brotherhood was clearly disclosed; and the support which that position received paved the way for still more arbitrary action in the future.

But despite this impressive warning as to the arbitrary methods of the brotherhoods and as to the resulting public menace, Congress took no action to protect the public. On the contrary, about two months later legislation was adopted which seemed designed to remove the lid entirely and to give railroad unions and other unions still more power and to make the nation still more defenseless. This legislation was the Clayton act, which was approved by the President on Oct. 15, 1914. Sections 6 and 20 of that act were inserted by way of compliance with the demands of the labor unions. Section 6 may be construed to provide that the existence and operation of labor unions and the action of their individual members shall not be deemed restraints of trade under the Anti-Trust act. Section 20 may be construed to provide that strikes shall be regarded as lawful no matter how unreasonable their purpose or their method. The prevailing opinion seems to be that these sections deprive the Government of any means whatever to prevent conspiracy to restrain commerce through a railroad strike, no matter how widespread the strike or how unreasonable the motive which actuates the strike.

Mr. Hines declared these were the things which "emphasized and increased the power of the railroad labor unions and encouraged them to their climax of arrogance, which came last August." Continuing, he said:

Under the law as it seems to be construed by the Government, the country has no voice whatever in preventing or postponing a railroad strike, no matter how widespread it may be or how arbitrary the leaders of railroad labor may be. The result is that until there shall be some general remedial legislation, the railroads are left in a position which is full of danger to the public and full of discouragement to prospective investors whose capital ought in the public interest to be used in the further development and improvement of the railroads. Since the Government is unable to get the railroad unions to do anything they do not want to do, the whole pressure of the Government is exerted to get the railroads to concede whatever the unions insist upon. When Executive pressure fails, then Congress seeks to grant by hurried legislation what the labor unions demand. If such legislation proves constitutional, the railroads must try to shift the burden to the public, and to do this must get the approval of the Interstate Commerce Commission, and to some extent of state railroad commissions.

The continuance of such a condition is a menace to the soundness of present and future railroad securities, because if railroad revenue is thus put at the mercy of the railroad unions, no one can have confidence in the ability of the railroad companies to continue to earn sufficient net income to pay interest, rentals, and dividends and to provide the annual surplus necessary to protect railroad credit.

Of course there will be and must be consideration of this matter by Congress until some method can be found for the settlement of these controversies in a legal and orderly way in accordance with the rights of all parties concerned. But I wish particularly to emphasize that no such law can be passed except over the opposition of the railroad brotherhoods; for they have declared in the most unqualified manner that they will oppose any law which seeks to provide for an official investigation of the merits of a dispute before a strike can take place and will oppose any other law through which the Government would interfere in any way with the unrestricted freedom of railroad labor to strike whenever it sees fit. When you consider the past record of Governmental compliance with the wishes of union labor, you will realize that it is not going to be an easy thing to get the necessary remedial legislation when that will be violently opposed by union labor. We must expect the labor unions to use in the future all the political power they can command just as they have done in the past.

Foreign Trade in Copper

Exports of copper from the United States in August are reported by the Department of Commerce as below, in pounds:

Ore and concentrates, contents	405,717
Unrefined, blister copper, etc.	28,460
Refined bars, etc.	64,158,773
Plates and sheets	881,649
Wire	1,734,701
Total copper, lb.	67,209,300

The weight of ore exported in August was 5,071 tons; of concentrates, 527 tons.

Imports of copper into the United States in August are reported by the Department of Commerce as below, in pounds:

Ore and concentrates, contents	15,539,695
Matte, contents	973,155
Unrefined, etc., in bars, pigs, etc.	26,651,896
Old, etc., for remanufacture	579,177
Composition metal, copper chief value	146,934
Total copper, lb.	43,890,857

Actual tonnage of copper-bearing material imported in August was 40,916 tons ore, 18,896 tons concentrates and 1,117 tons matte.

Mining in India in 1915

The Chief Inspector of Mines in India has just issued his annual report of 1915. In addition to information regarding persons employed, accidents, health and sanitation, the following figures of output are given: Mica, 24,063 cwt.; manganese, 378,172 long tons; gems, 251,449 carats; gold, 24,320 oz.; copper, 8,010 long tons; wolfram, 39,432 cwt.

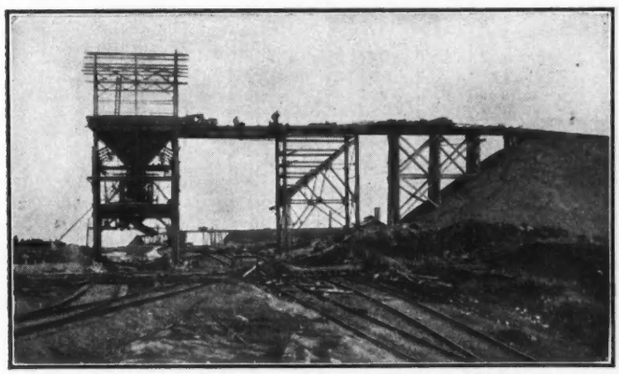
It should be noted that this report does not give a complete review of mining in India, but confines itself to those mines and quarries coming under the scope of the Indian Mines Act of 1901, which excludes workings that are shallower than 20 ft. The complete figures are given in the records of the Indian Geological Survey.

Details of Practical Mining

Screening Rock from Iron Ore

By L. A. Rossman*

One of the problems which confronts the mining operator is the removal of the rock, or taconite, from iron ore. In many of the ore deposits on the Mesabi Range this rock is found in what are called "horses," constituting enormous pillars throughout the whole deposit or forming horizontal or dipping strata of varying thicknesses with ore between. At the Susquehanna mine, an openpit property of the Rogers-Brown company at Hibbing, taconite appears intimately mixed with the ore. If the property were being worked underground, this rock would be picked out and left in the workings. In the openpit method



SUSQUEHANNA SCREENING PLANT IN COURSE OF CONSTRUCTION

of the Mesabi Range, the elimination process has formerly been to pick out the ore by hand from in front of the shovel, where it is loaded into dump cars and hauled away. This is a very arduous and expensive operation and the Rogers-Brown company has put into use another method—that of passing the ore and taconite, just as it comes from the ore bank, through a screening plant.

The process used is simple. The plant structure, which was completed this summer, is of steel, the building being 26 ft. wide, 40 ft. long and 51 ft. high. The ore is brought on a trestle, shown in the accompanying illustration, to the top of this building in 12-yd. automatic air-dumped cars. They are pushed in ahead of a locomotive that can handle five of them on the 4½% grade on which the approach is laid. The ore is dumped from these cars onto grizzlies formed by standard 85-lb. rails set on 30-in. centers. The great rock chunks that rest on top of these grizzlies are broken up and fall with the rest of the material into a large steel bin, which will hold six of the dump cars of ore. The ore then passes through the bottom of this bin into the screen, its passage being regulated by means of a gate and feeder. The screen onto which the ore passes is circular, 60 in. in diameter and 24 ft. long. It much resembles the trommel found in concentrating plants, except that its diameter is the same throughout its whole length and the incline is secured by setting the supports at an angle. This screen slopes 1¾ in. per ft. and its perforations are of 2-in. diameter. The ore passes through these perforations into the bin, from which it is drawn into the cars, while the rock oversize discharges into chutes, from which it is fed into dump cars and thence carried to the rock piles. It will thus be seen that the ore that passes the screen is fine and light, though not as fine as that which characterizes the washed product. From the shipping-ore bins the feeding of the ore into cars is controlled by arc gates.

A motor of only 30 hp. supplies all the power required. The machinery is all of Allis-Chalmers manufacture and the structural work was done by the American Bridge Co. This is the first season in which this plant has been operated. At present all of the ore from one steam shovel is being taken care of by this method. Fifty-five 40-ton cars of the product have been handled in 10 hr., together with ten 16-yd. cars of rock and waste. The capacity of the plant is thus large and sufficient for the openpit. While the plant is still considered an experiment, results are said to be very satisfactory. The success of the undertaking means much not only to the individual mining company, but to all those on the Range.

*Grand Rapids, Minn.

Three Types of Oil-Fired Boiler Installations in Arizona

Three different types of boiler installations using oil fuel attracted the attention of A.I.M.E. members visiting Arizona in September. The installations, though dis-

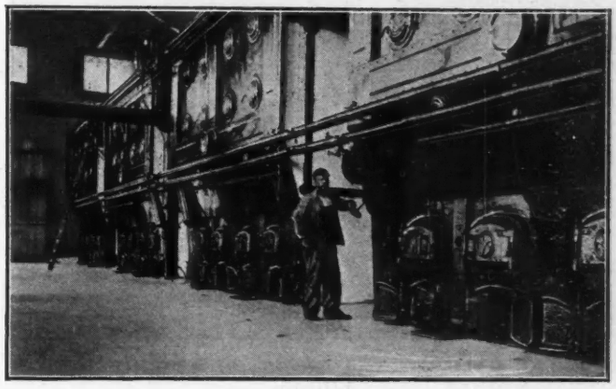


FIG. 1. OIL-FIRED BOILERS AT THE COPPER QUEEN

similar in many respects, gave surprisingly uniform efficiency results. Fig. 1 shows the boiler-house interior at the Sacramento power house of the Copper Queen company at Bisbee. The over-all efficiency of this plant was stated as 81.29%. Economizers were used. Fig. 2 shows a similar installation at the Inspiration power house at Miami, Ariz., where an efficiency of from 79 to 83% is obtained. Fig. 3 shows the installation at the Junction power house of the Calumet & Arizona com-

pany, near Lowell, in the Bisbee district. These are old boilers, Scotch-marine type, and have been moved many times, having the advantage that on such occasions there

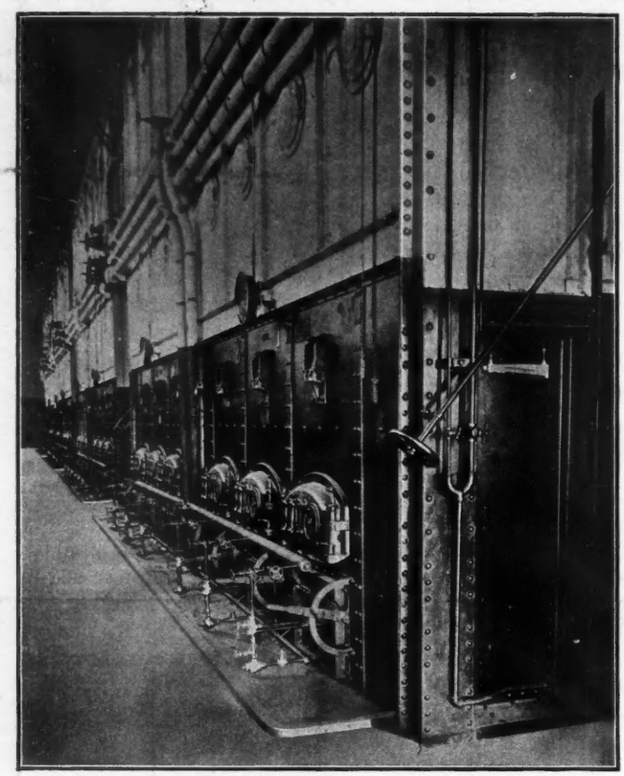


FIG. 2. OIL-FIRED BOILER INSTALLATION AT THE INTERNATIONAL SMELTERY

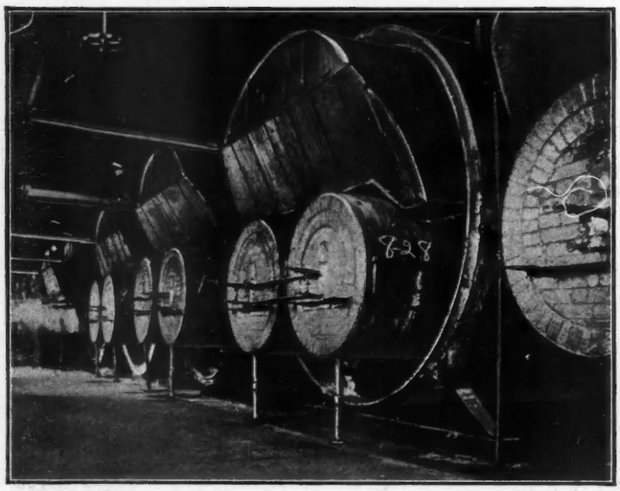


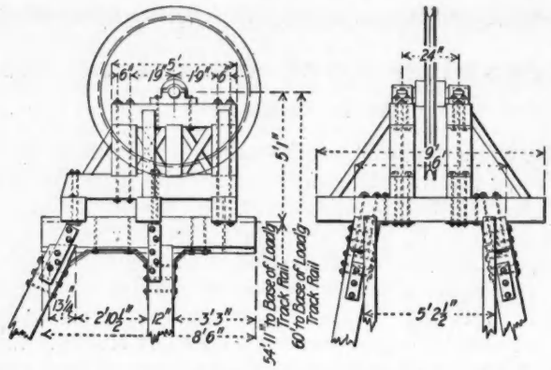
FIG. 3. CALUMET & ARIZONA OIL-FIRED SCOTCH BOILER

is no large amount of brickwork to be torn down and replaced. This plant gives an operating efficiency of from 75 normal to 83.5% maximum.

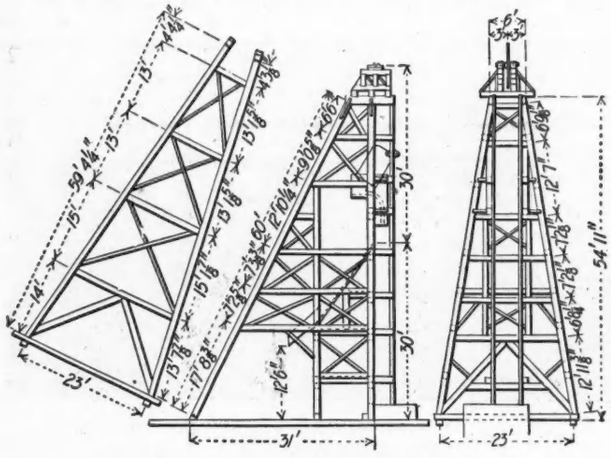
Dust Prevention About Mine Plants or other industrial works is necessary for the health of the workers if for no other reason. The dust losses of ground products is considerable and often of considerable value. The obscuring of lights by dust is another injurious factor. To reduce dust losses in a large steel plant the raw materials entering the plant, iron ore, and limestone are first sprinkled. The cars containing the material are run onto a siding over which a sprinkling system is installed.

The Tioga Headframe

A headframe similar in design to those used by the Oliver Iron Mining Co., but made of timber instead of steel, is in use at Chisholm, Minn., on the property of



DETAILS OF THE SHEAVE WHEEL AND BEARINGS

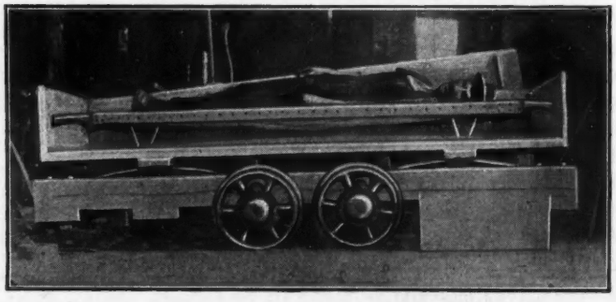


CONSTRUCTION OF THE HEADFRAME

the Shenango Furnace Co. It is set over a single-skipway shaft and was built from material on hand. Timber to the amount of 25,000 ft. b.m. was used, together with the necessary ironwork and bolts, as shown on the accompanying details. The total cost of this headframe was $2,300.

Underground Mine Rescue Car

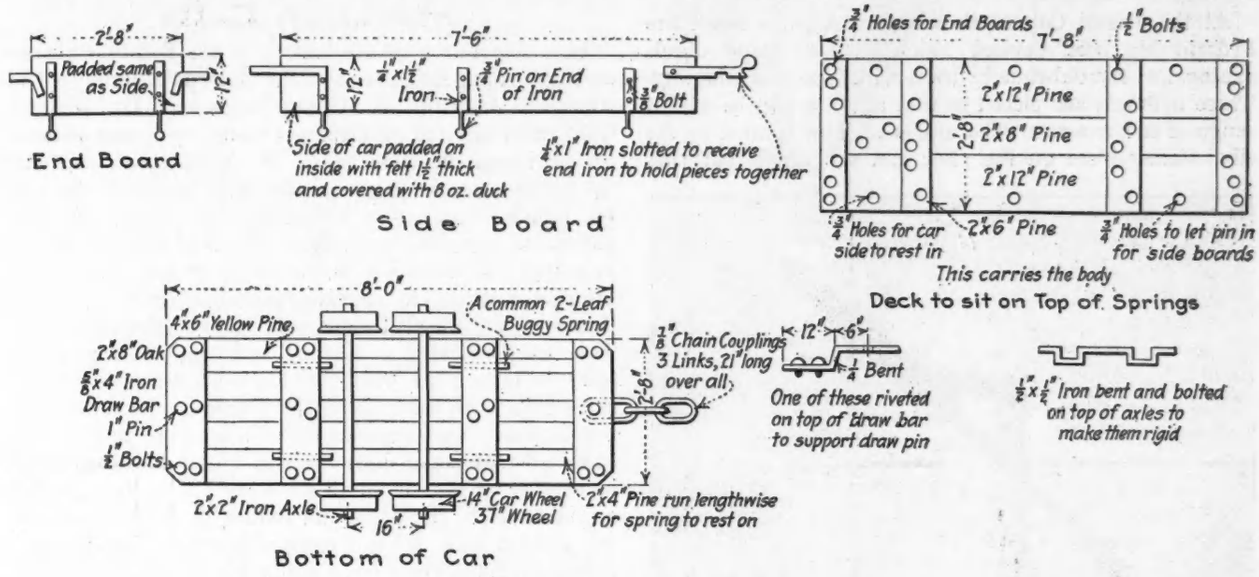
The Illinois Zinc Co. has done much to provide for the comfort of its employees. One of the latest improvements designed by J. A. Ede, the consulting mining engineer of the company, described by Gaston Libiez in



THE RESCUE CAR COMPLETE

Coal Age, Oct. 14, 1916, is a stretcher car by which injured men may be brought in comfort and without jolting to the surface. The design is quite simple—a skeleton mine truck supporting carriage springs to which a box, in which the stretcher is placed, is secured.

The first car of this type was constructed at the Deer Park mine, southeast of La Salle. Another will be built at Peru and used at the mines at that place. A box


2'-8"
Padded same as Side
12"
End Board
7'-6"
1/4"x1 1/2" Iron
12"
3/4" Pin on End of Iron
3/8" Bolt
Side of car padded on inside with felt 1 1/2" thick and covered with 8 oz. duck
1"x1" Iron slotted to receive end iron to hold pieces together
Side Board
3/4" Holes for End Boards
7'-8"
1/2" Bolts
2"x12" Pine
2'-8"
2"x8" Pine
2"x12" Pine
3/4" Holes for car side to rest in
2"x6" Pine
3/4" Holes to let pin in for side boards
This carries the body
Deck to sit on Top of Springs
8'-0"
4"x6" Yellow Pine
A common 2-Leaf Buggy Spring
2"x8" Oak
5/8"x4" Iron Draw Bar
1" Pin
1/2" Bolts
7/8" Chain Couplings 3 Links, 21" long over all
12"
6"
1/4" Bent
One of these riveted on top of draw bar to support draw pin
1"x1/2" Iron bent and bolted on top of axles to make them rigid
2"x2" Iron Axle
16"
14" Car Wheel
31" Wheel
2"x4" Pine run lengthwise for spring to rest on
Bottom of Car

DETAILS OF CONSTRUCTION OF THE CAR

is slung from the truck portion of the car. In this will be kept bandages, salves and stimulants and a lungmotor. The car will be kept in a dry place specially provided for the purpose. This place will be at some point near the face of the workings.

The cost of the car, including all labor and material, was $80; the length over all is 8 ft., the width 2 ft. 8 in., and the height of the box 12 in. The bill of material is as follows:

Lumber:

2 pieces 4x6 in. by 8 ft. long, yellow pine.
2 pieces 2x12 in. by 7 ft. 8 in. long, yellow pine.
1 piece 2x10 in. by 7 ft. 8 in. long, yellow pine.
4 pieces 2x6 in. by 2 ft. 8 in. long, yellow pine.
4 pieces 2x8 in. by 2 ft. 8 in. long, oak.
2 pieces 2x4 in. by 8 ft. long, yellow pine.
4 pieces 1x12 in. by 7 ft. 8 in. long, yellow pine.
2 pieces 1x12 in. by 2 ft. 8 in. long, yellow pine.
1 piece 1x10 in. by 7 ft. 8 in. long, yellow pine.

Iron and Bolts:

60 3/8x1 3/4-in. carriage bolts.
40 1/2x4 1/2-in. carriage bolts.
35 1/2x9-in. carriage bolts.
20 1/2x3-in. carriage bolts.
10 3/8x3-in. carriage bolts.
1 piece 5/8x4-in. iron 8 ft. long.
2 pieces 5/8x4-in. iron 20 ft. long.
10 pieces 1/4x1 1/2-in. iron 14 ft. long.
2 pieces 1/2x2-in. iron 30 ft. long.
5 No. 3/8-in. cut washers.
10 No. 1/2-in. cut washers.
1 7/8-in. chain in three links, 21 in. long.
1 1-in. pin, 8 in. long, with 12 in. of 1/4-in. chain attached, to go with car to couple with 4 common two-leaf buggy springs made out of 1/4x1 1/2-in. spring steel; length over all, 3 ft.; distance between springs, 8 in.
1 set of 14-in. diameter car wheels.
2 2-in. standard axles, 3-ft. 1-in. gage.

Siberia Is to Have Large Steel Works—The plan, as a result of a recent meeting between representatives of the Russian Government and of the iron industry, is to raise a capital of 20,000,000 rubles, the interest to be guaranteed to the banks subscribing. The government is to lease the district of Kusnezk, where the works are to be located, to the company for 60 years, the company to supply a fixed tonnage of rails and other railroad material yearly at current prices. This district has coal and iron deposits, the iron ore being of high grade.

Utilizing Old Candle Boxes

At a medium-sized copper mine in the West a number of different types of air drills were in constant use, and of two of these types there were three sizes each. Since parts were broken at frequent intervals, it was necessary to keep quite a stock of extras. In addition to the regular stock of mine supplies, such as pipe fittings ranging from 1/4 in. up to 4 in. and all the rest of the daily necessities, this made the task of storekeeper no sinecure; especially in consideration of the fact that he was expected simultaneously to fill two other important positions. The various items, from piston-ring springs to saw files, were spread out on shelves in the lower part of the crusher building, the room being narrow and long. In an unused corner a pile of empty candle boxes accumulated in a haphazard fashion, and the dust from the mill-feed bins sifted down as the vibration of the machinery jiggled things out of place. Various employees drifted in now and then, helping themselves to different supplies and seldom leaving any message except when some particular item was exhausted from the stock.

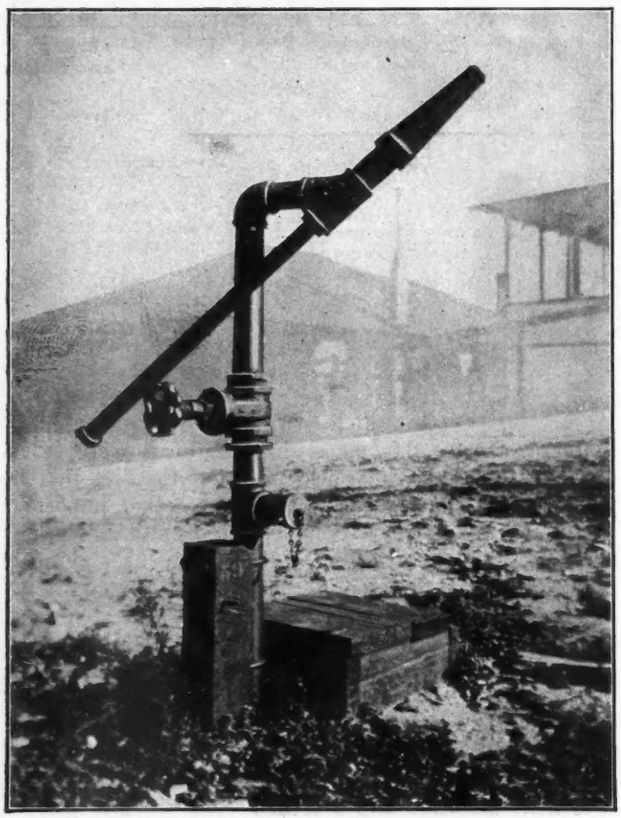
A little ambition and overtime work brought about a slight change. The candle boxes were stripped of superfluous nails and arranged in tiers in a smaller room at one end of the building. Small cleats were nailed here and there to prevent shifting or toppling forward. To each size of each type of drill a vertical tier was assigned, others being selected for pipe fittings and the like; the heavier parts being placed in the lower boxes, while the smallest parts were arranged in cigar boxes set inside the candle boxes. When complete, the general effect was like a set of sectional bookcases in a library. The fact that the small room was ceiled, combined with the protection afforded by the individual recesses, reduced the accumulation of dust to a minimum.

By moving one group of supplies each day a card-index inventory was made. When this was completed, the value of stock actually on hand was found to be only about 60% of the theoretical stock showed by the large stock sheets, which had been made out laboriously each month on the basis of material received and material known to have been issued.

Details of Milling and Smelting

Fire Hydrant Used at Miami

At the Miami Copper Co., Miami, Ariz., a novel fire hydrant has been devised which obviates many disadvantages of the old-time hydrant with hose and coupling. These hydrants are placed so that any fire will be within range of one or more. The universal joint formed by the elbow being loose on the riser and the nipple carrying



"MONITOR FIRE HYDRANT" AT MIAMI, ARIZ.

the angle nozzle connection being loose in the elbow allows the stream to be turned in any direction. No hose is used. The nozzle is cylindrically bushed so that a solid stream is thrown. These hydrants are cheaply and quickly made and fill the requirements perfectly. They look like young hydraulic giants.

Effect of Tin on Mechanical Properties of Steel has just been reinvestigated by J. E. Stead, and reported on at the autumn meeting of the Iron and Steel Institute. His results apparently show that 0.1% Sn produces an increase in maximum stress of 1.4 tons and a decrease in elongation of 0.8%. Doctor Stead thinks it doubtful whether 0.05% Sn would have any material effect on the properties of structural steel, or that the use of 10 to 15% of detinned scrap in steel for forgings, rails or plates, but they show that tin in sensible quantity must be avoided, as it tends to make steel difficult to roll and hard and stiff when in the heated state. Research is urgently required to determine the effect of small quantities of tin owing to the large quantities of detinned scrap which will soon be available for steel making.

Use of Porous Bottoms in Flotation Cells

In a description of the history of the flotation process at Inspiration, Ariz., read at the Arizona meeting of the American Institute of Mining Engineers, Dr. Rudolph Gahl described the experiments made on porous bottoms for pneumatic-flotation cells. Dr. Gahl points out that the porous bottom is one of the most essential parts of the bubble-column type of flotation machine. The experiments made at Inspiration indicated that one of the principal difficulties was the tendency of the pores of the filtering medium to contract gradually under use and therefore to retard the passage of air through them. This tendency appeared to be more pronounced in the solid bottoms used with the Flinn-Towne type of machine than with those using the textile bottoms, although the tendency was apparent even there. It was at first supposed that the choking was due to the dust that might be carried by the air admitted below the bottoms, which might settle in the pores and reduce their area. A canvas blanket will, after a certain length of service as a porous medium, show rings and spots of dark color opposite the air inlets, indicating a deposition of dust particles.

In order to investigate the influence of such spots on the air passage, round disks were cut from a Callow blanket that had been used for some time, and their character was investigated by using them as porous bottoms in a glass tube standing in a vertical position. Air under pressure could be applied to an air chamber under the disks and the air passing through the material could be measured by a gas meter. The air discharged through the material gives a measure of its porosity. It was found, through these tests, that the darkest spots were not the points of lowest porosity—those farthest away from the air inlet showing the greatest tendency to choke. An explanation of this surprising behavior seems to be in the fact that the blanket is more thoroughly agitated near the air inlet, while the more distant parts are comparatively quiet. Incrustations, due to the presence of soluble salts in the water, in conjunction with fine slimes, always form to a greater or less extent in the top layer of the blanket. Agitation opposes this formation, thus allowing the quieter parts to be more completely covered.

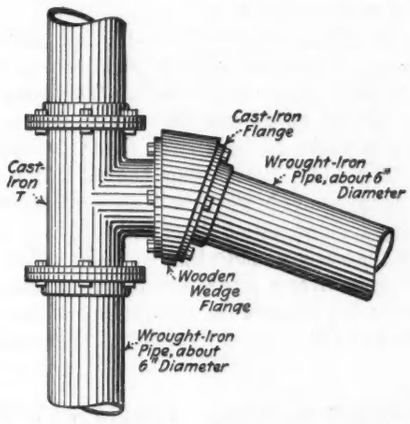
Through this reasoning it was concluded that a solid porous material is not as suitable for a diaphragm as the textile material if a bottom of long life is required. This conclusion seems to agree with the experience of everyone who has experimented in the matter. Carborundum tubes and stones have been tried and abandoned, most operators returning to the textiles.

It appears to be a necessary condition for serviceable flotation-cell bottoms that they be of a flexible nature. The 4-ply canvas, stitched every half-inch or so, with which Callow's first cells were equipped, seems to answer the purpose well. To keep it in good condition and free from incrustations it has to be cleaned frequently. This is done by dipping an iron pipe, connected with the water

hose, into the compartments and sweeping the canvas bottom with the jet of water discharging from the lower end of the pipe.

A Wooden Angle Flange

In the concentrating mill of the Old Dominion at Globe, Ariz., an ingenious method of making a pipe connection at an angle without the use of special fittings, which cost money and require time, was devised as shown in the



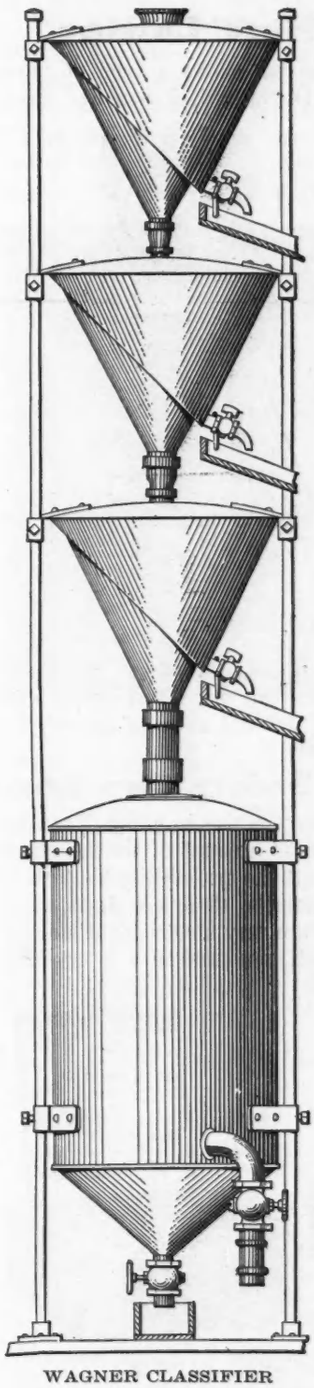
A WOODEN ODD-ANGLE PIPE FITTING

sketch. By simply cutting a wooden wedge to fit snugly between the flanges, drilling, boring and trimming the outside and using the customary bolts and gaskets, a perfectly tight and satisfactory job was secured.

Wagner Hydraulic Classifier

Frank F. Wagner, of Denver, has invented an improvement in hydraulic concentrators or classifiers, which was granted patent No. 1,193,953 on Aug. 8, 1916. The object of the invention is to provide a concentrator in which the metallic minerals may be separated from the gangue by the action alone of an upwardly directed current of water or oil and to separate the metallic minerals into different grades, varying in specific gravity. This is accomplished by the employment of a number of tanks, preferably cone-shaped, having their smaller extremities lowermost. Each of these tanks is provided with a trough at the top to receive an overflow, which carries gangue or uncleaned minerals, as may be required and according to the adjustment of the apparatus.

Referring to the illustration, the apparatus consists of a bottom tank, preferably cylindrical in shape, and a series of cone-shaped tanks forming a superstructure, the lowermost cone-shaped tank being in communication with the cylindrical tank at the top, the next higher tank having its lower extremity in communication with the top of one below, and so on depending on the number of tanks employed, the lower extremity of any tank being in communication with the upper extremity of the one next below. The diameters of the pipe connections between the lowermost cone-shaped tank and the cylindrical tank, and between the various cone-shaped tanks, diminish in an upward direction. The reason of this variation in size of the various pipe connections is that the water, which is introduced from below and is carried upward through all the tanks under pressure, diminishes in volume, so that while the entire volume of water enters the lowermost tank, a portion is drawn off with the material taken from this tank, so that a less quantity of water enters the tank next above and so on. By diminishing these pipe connections on this principle, the construction is made to harmonize with the existing conditions and better results are obtained than would be the case if these pipe connections were all of the same size. In the construction shown in the illustration there are four tanks, the lowermost being cylindrical and the others cone-shaped. With this apparatus the gangue is caused to overflow at the top of the uppermost tank into a trough, and is drawn off by means of a faucet or other suitable valve-controlled device. The tank next below is similarly equipped with an overflow trough, from which is drawn off a heavier grade than the silica, which may be termed middlings and which will contain some metallic minerals but of relatively low specific gravity. The third tank from the top is also equipped with an overflow trough into which will be carried a grade of practically pure mineral, but of greater specific gravity than that included in the middlings. Finally the metallic minerals of greatest specific gravity will be caught in the lowermost or cylindrical tank, and may be drawn off into a trough or other receptacle arranged at the bottom of this tank. From this it will be understood that as many different grades of material, separated according to their varying specific gravities, may be made as desired and according to the particular material under treatment. While the apparatus has been designated a concentrator, it is equally well adapted for use as a sizer or classifier, and whether it is used for the one purpose or the other depends on the character of the material under treatment as regards the size of the grains or particles.

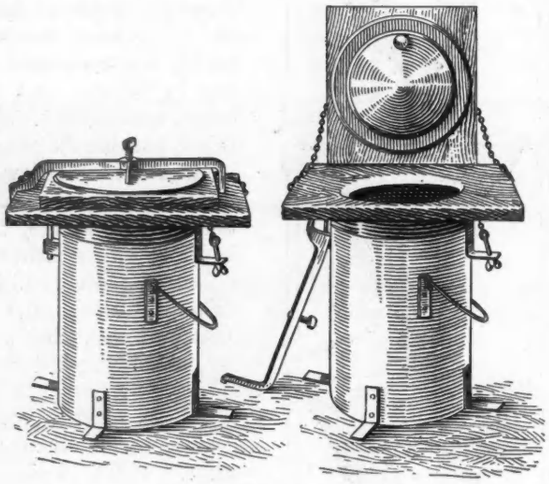


WAGNER CLASSIFIER

Mining & Metallurgical Machinery

A Sanitary Mine Latrine

The accompanying illustration shows a type of mine latrine manufactured by E. D. Bullard, of San Francisco.

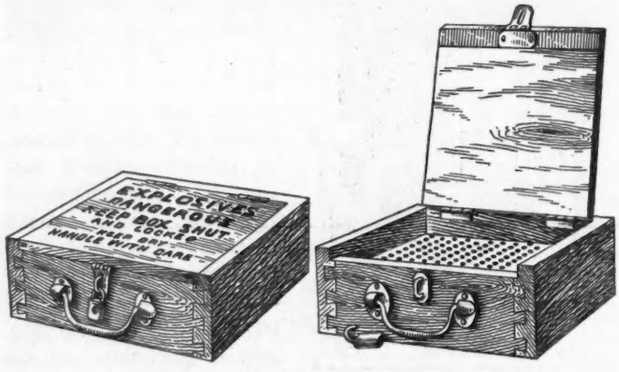


A SANITARY LATRINE

This type recommends itself because of its simplicity and sanitary properties. It can be taken apart and cleaned when necessary.

A Convenient Safety Cap Box

Although it is a dangerous practice to carry dynamite and caps in the same vehicle on account of the sensitiveness of the caps to shock and the probability that their explosion would fire the dynamite, there are times when separate loading or two trips are very inconvenient and expensive. To provide for such cases and also to care for



A SAFE BOX TO CARRY CAPS IN

caps in the field, a safety box has been designed that makes it feasible to transport caps and dynamite in the same vehicle without extraordinary risk, and greatly decreases the risk from flying fragments in field blasting.

This box as illustrated, from the *Du Pont Magazine*, September, 1916, is made of oak 7/8 in. thick, dovetailed at corners and with rabbeted bottom of oak. The top is of 1/2-in. pine with blind hinges and staple. The loaded box cannot be opened without destroying the cover. Even the most enterprising pryer will hesitate to use force on a caseful of sensitive explosives.

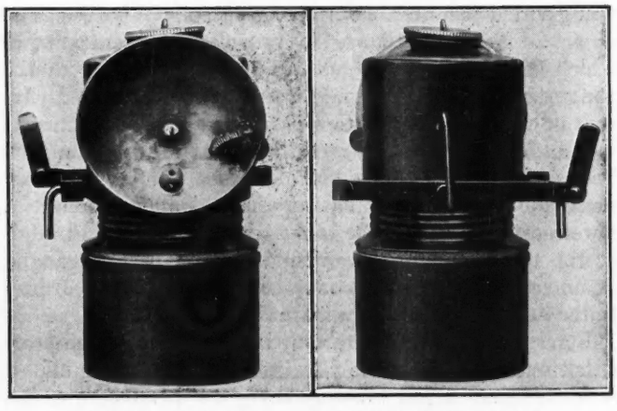
The box is lined inside with 1/2-in. felt, obtainable at harness shops. The cap board is removable, but should fit snugly on and between the felts. The space between the bottom of the cover and the top of the bottom felt should be jest right to hold caps firmly without undue pressure. The holes in the cap board, 100 in number, should be large enough to permit easy entrance of caps, but not large enough to let them fall out.

The fact that a box made this way was filled with 100 caps and thrown over a 50-ft. embankment into a quarry, where it bounded around on the rocks and no explosion resulted shows that it should fulfill its requirements.

Acetylene-Lamp Improvements

The use of acetylene lamps in metal mines has greatly increased in the last three years. Mine managers have been quick to appreciate the considerable saving possible by replacing candle illumination with that of carbide. Many mines now use carbide lamps in at least a portion of the underground works, while a considerable and increasing number have abandoned candles altogether in their favor.

With the increased use of carbide lamps has come a demand for improved construction to meet underground-



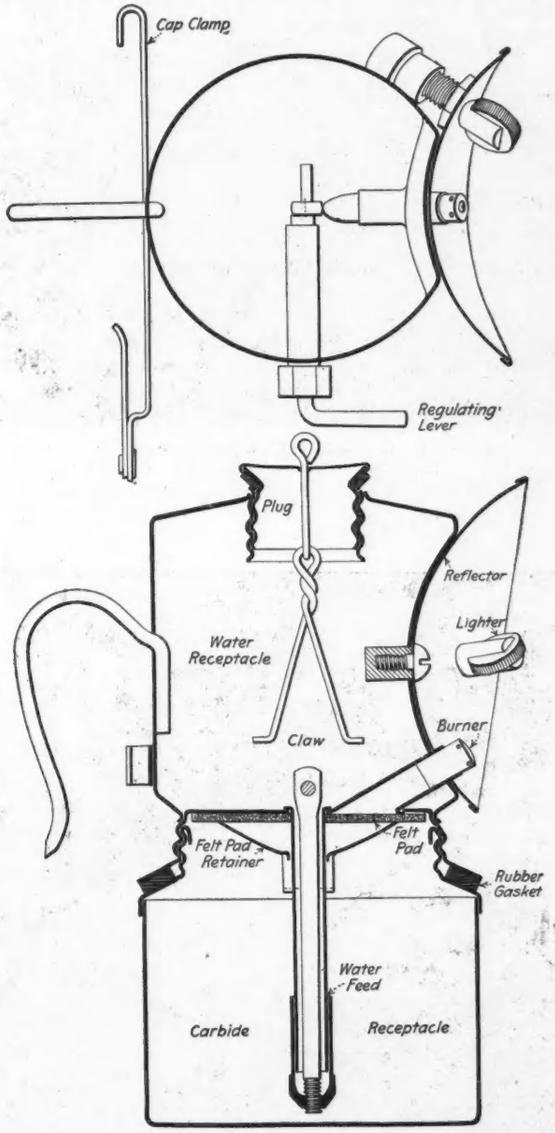
FRONT AND REAR VIEW OF THE LAMP

illumination requirements. Among those manufacturers who have responded to this demand is the Harker Manufacturing Co., whose improvements are shown in the accompany illustrations.

Perhaps the most important improvement from an illumination standpoint is the changed position of the burner. Instead of its former position in the center of the reflector, it is now placed near the reflector base, as best shown in the sectional view, and inclined upward. As a result, the flame reflects from a maximum of reflector area without impinging upon and burning it.

Engineers who in the past have experienced difficulty in vernier reading will be quick to appreciate the improvement.

Another improvement is the water-feed regulator. This is the lever seen at the side of the lamp. Turned to its most upward position, the water is shut off, and turned to the other extreme, the feed is wide open. After lighting the lamp with the regulator at wide-open position, in about half a minute the regulator can be adjusted to half-open position, or some other, according to the degree of illumination desired. Charged with 2 oz. of ¼-in.



DETAILED SECTIONAL VIEWS OF LAMP

carbide, in accordance with the manufacturer's directions, the lamp should burn for about four hours.

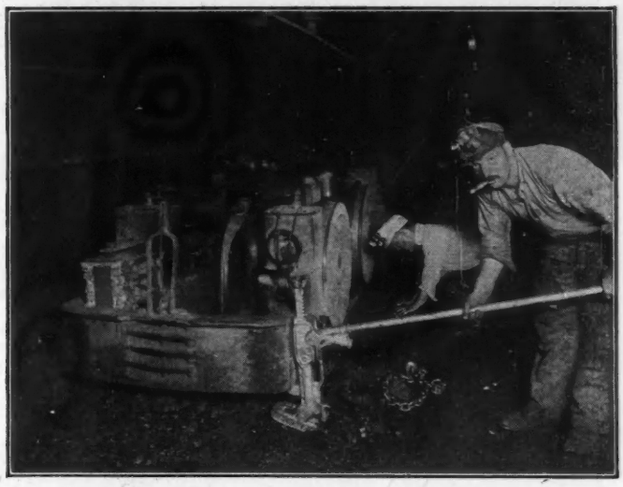
The lamp has a dark enamel finish and is equipped with a crossbar seen at the back, which, by means of a pivoted hook, firmly attaches the lamp to the tin front of the miner's headgear so that it cannot jolt with the wearer's stride.

When empty, the lamp weighs 6 oz. It is known as the Hoppe "Brite-Lite" miner's carbide lamp and is made by the Harker Manufacturing Co., 410 East Pearl St., Cincinnati, Ohio.

A General-Utility Jack

Templeton Kenly & Co., Ltd., of Chicago, Ill., have recently placed on the market Simplex jack No. 310 as a general-utility device. This jack is of strong and rugged construction and embodies features that render it available for a multiplicity of purposes at the mine, either above or below ground. It is described as follows in *Coal Age* of Oct. 14, 1916:

The chief advantage of this jack lies in its tilting base. This base is attached to the body of the jack by a hinge joint and may be locked in a position at right angles to the center line of the body; or, upon releasing the catch, the base may be tilted through an angle of almost 90°. The hinge pin passes through an elliptical hole in the hinge joint so that the thrust of the jack



ONE OF THE USES OF THE SIMPLEX JACK

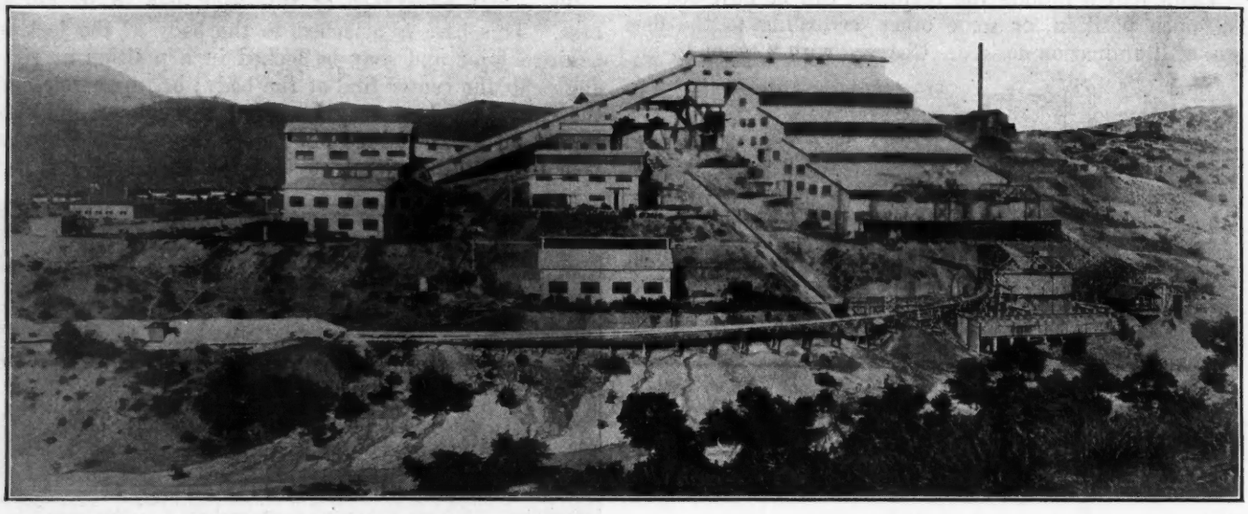
is taken directly by the foot and does not put a shearing stress upon the pin. The bottom of the foot is provided with suitable calks to prevent slipping when the tool is placed in an inclined position.

The adaptability of this jack to the general run of work encountered in and about a mine is extreme. The tilting base makes it unnecessary to provide a level footing when a vertical lift is necessary, or an inclined footing when an inclined lift is to be made. This is a great time saver when quick work, such as the replacing of a locomotive or car that has jumped the track and is blocking the entire transportation system, is to be performed.

Besides its applicability for emergency work on locomotives, etc., this tool may be used as an ordinary track jack, being provided with a suitable lifting foot, for the forcing to place of heavy mine timbers, or for other purposes.

A New Iron and Steel Plant in China is being erected for the Han-Yeh-Ping Iron and Coal Co., Ltd., of Hanyang. It is to be at Tayeh, about 20 mi. from its iron-ore mines. The site consists of about 670 acres. The new plant will start with two blast furnaces of 400 tons daily capacity each, with necessary equipment, and will eventually be extended to comprise eight blast furnaces with sufficient openhearth steel furnaces and rolling mills to convert the blast-furnace production into finished products. The contract for the first two blast furnaces was last year awarded to the Riter-Conley Manufacturing Co., Pittsburgh, but some delay ensued owing to a misunderstanding between that company and the agent of the Chinese company. Matters have now been adjusted, and it is expected that the material for the furnaces will be delivered by the end of this year.

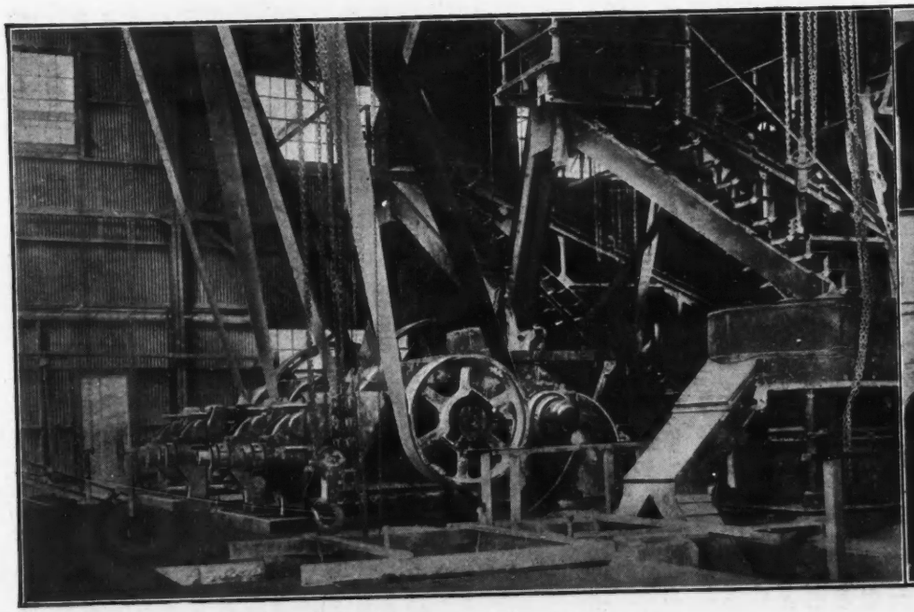
Photographs from the Field



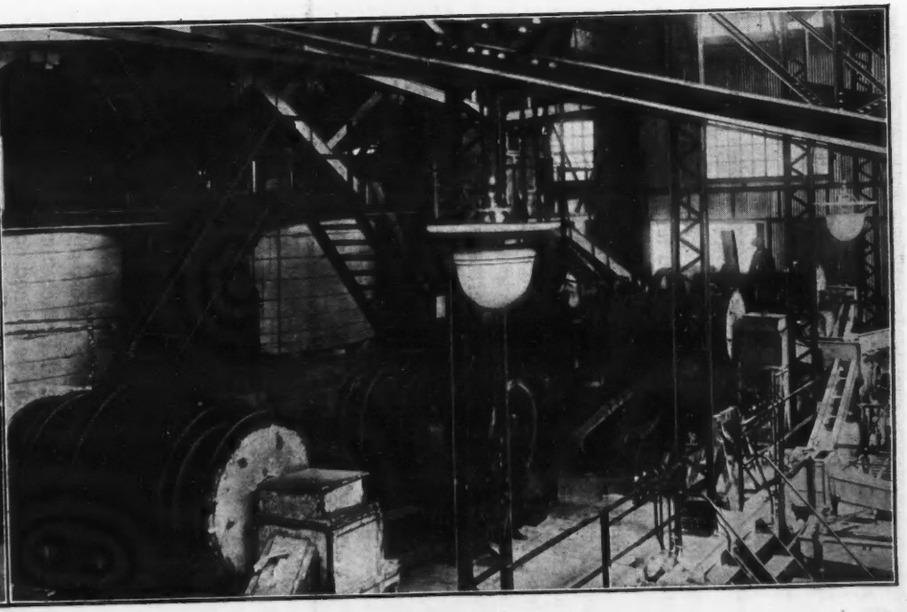
General view of the concentrating plant, showing from left to right the assay office, the coarse crushing plant, beneath which is the machine shop, conveyors, coarse-ore bins, below which are successively the transformers, supply house and carpenter shop. The Dorr slime thickener is below the concentrator. The tailings launder is shown across the bottom of the view

The large Dorr thickener for handling the flotation concentrates

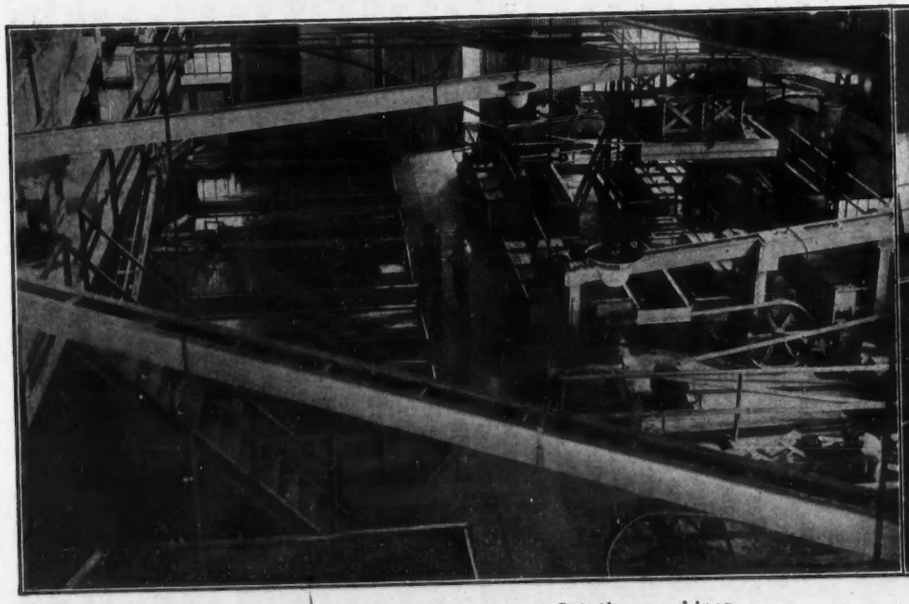
VIEWS OF THE PLANT OF THE BURRO MOUNTAIN COPPER CO., TYRONE, N. M.



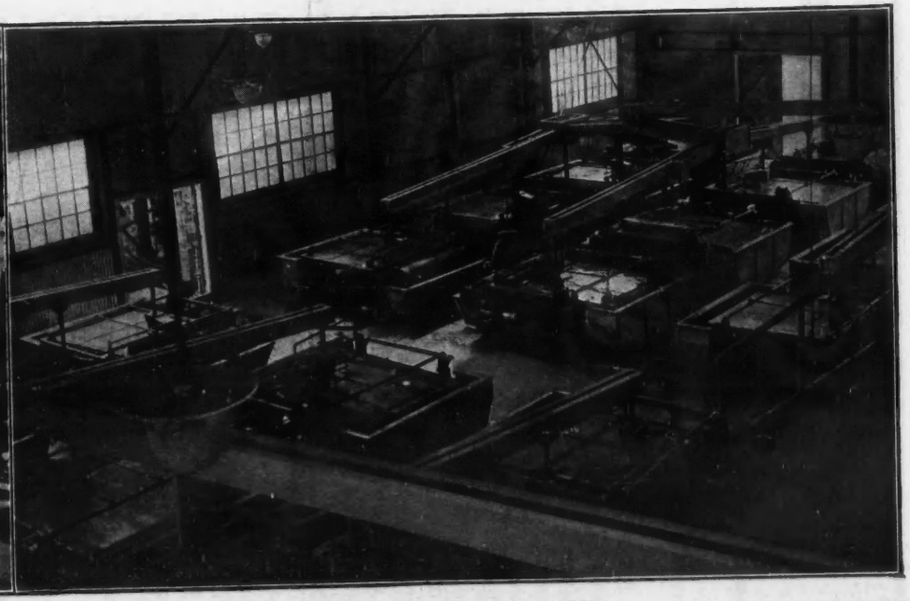
Allis-Chalmers rolls in crushing plant



Marathon mills for regrinding



The Butchart tables and Rork-Kraut flotation machines



Senn pan-concentrating tables

INTERIOR VIEWS OF THE BURRO MOUNTAIN CONCENTRATOR

Correspondence and Discussion

The Attempted Tyranny of Labor Unions

After reading several *Journal* editorials concerning the recent transportation strikes, etc., I cannot restrain expression of my profound disgust with them. Their sneering one-sidedness must be obvious to the most prejudiced. Why do you, with such persistent hypocrisy and affected horror, charge that a concession to the labor unions is a victory of the minority, a holdup of the public, a defeat of democracy? For example, in the case of the threatened railroad strike, why do you insist on seeing it as a contest between the interests of 100,000,000 and the interests of 400,000 (the brotherhoods) instead of between the interests of the 400,000 and the interests of several thousand (?) railroad stockholders? You employ the old editorial trick of "seeing" the public as a neutral element whose "rights" you so nobly champion and over which you shed crocodile tears.

By subdividing the labor element into its striking and nonstriking parts, you create a third "neutral element" (the public) into the contest, from the standpoint of whose interests you view the contest and use this neutral element as a fine weapon with which to combat the success of the strikers. The public, on the contrary, is a party to the quarrel, of necessity very much concerned—unfortunately, more so than it knows—through sympathies and interests, for the public is largely that part of labor which happens to be passive while its complement is striking.

Again, when you refer to the traction strike in New York, you grossly misrepresent facts known to every wide-awake New Yorker. The companies, not the men, broke the agreement, as was borne out by the facts learned by the investigating commission and embodied in their statements. The companies forced the strike. When the same strike first threatened some time previously, the companies quickly settled to the men's satisfaction. Then, while making adequate and systematic provision for a strike (having secured through agencies, strikebreakers from different parts of the country and accommodations for these) it began to make individual proposals (individual contracts) contrary to the agreement, leaving the men to choose between disintegrating their union or going out on strike to preserve it. Hence the companies' action could be interpreted only as a stragetic (*sic*) lockout, intended to destroy organizations among its men, against which it frankly declared itself. It thus caught the men unprepared, yet despite this there was greater interruption to traffic than your editorial would indicate. You mention nothing of the demoralized surface-car systems or the terror of the public at the innumerable fatal and serious accidents due to inexperienced hands. Furthermore, as any observant person will attest, the public demonstrated its sympathies with the strikers on all occasions afforded it (at many benefits held and street collections made and changed mode of travel). The private machines, Fifth Avenue busses and the New York Central R.R., all charging several times the companies' rates, carried and still carry great crowds, all of which indicates the loss of trade by the "struck" lines and the sympathies of the public and emphasizes that the strike did have effects. I cannot believe that you do not know these facts.

Incidentally, you admit the dependence of the many on the "bounty" of the few—that is the real "tyranny," autocracy, you will not see. This is the minority—the class control, which labor through organization is beginning to challenge, and their victory is a victory of the interests of the many, a democratic victory.

How long will editors think they can boldly lead the readers' thoughts with utter confidence and credulity—that by making frequent reference to history in glowing terms, by raising cries of "tyranny" and "democracy" and sounding warnings, by using catchy phrases and labored eloquence, they can affect sincerity and all will be accepted as given. I wonder how many other readers feel as I do. I hope you will have the fairness to publish this letter.

New York, Oct. 11, 1916. WILLIAM CULLICOVER.

Mining in Huelva, Spain

You probably know that the iron-copper district here is one whose production is practically monopolized in the province of Huelva. Now almost all of the mines are in the hands of English and French houses, but there is still an area from which may be formed business that may rival Rio Tinto or Tharsis in importance. Because of the war, at its end there will be strong competition among the nations to secure the best of this opportunity. I have thought of addressing you to know if you consider it possible to take any steps to start and carry to a conclusion such a business. I am an engineer, practicing my profession here, and have 18 years' experience in the district.

Such a business would require a very large capital. For less money a more modest development might be started, but not taking in all the possibilities.

I would be glad to have you advise me what you think the possibilities are in this direction.

JUAN HEREZA.

Plaza de Monjas, 8, Huelva, Spain, Aug. 17, 1916.

Refractory Manganese Ores

In the *Journal* of Oct. 7 Henry O. Marcy states: "I believe that to Mr. Rowe belongs the credit of first reducing the refractory silicate ores of manganese, iron and copper, and producing commercial quantities of metal in the electric furnace," etc.

In California, to my knowledge, silicate ores of manganese have been smelted for over a two-year period. From April, 1915, to October, 1915, rhodonite ores from Mendocino County, Calif., and also from Alameda County were smelted in an electric furnace into 80% commercial ferromanganese and on a 15-ton per day production. During the rest of the time pyrolusite and psilomelone ores were smelted into 80% alloy and on a 14- and 16-ton per day production. I mention this for the general information of *Journal* readers. R. C. GOSROW.

1304 W. 51 Place, Los Angeles, Calif., Oct. 16, 1916.

Oxygen Mine-Rescue Apparatus*

By E. Steidle†

SYNOPSIS—The United States Bureau of Mines now uses three types of apparatus. Tests have been made since 1908. Eight rescue cars, five rescue stations and three emergency automobiles are now operated. More than 10,000 miners have been trained to use apparatus. Helmets have been discarded for rescue purposes, only mouth-breathing apparatus being now used, but specifications require bypass to permit drawing on oxygen supply in emergencies.

Various kinds of apparatus are used for entering irrespirable or poisonous gases, following explosions or during fires in mines. These have been popularly termed "oxygen helmets" or "artificial breathing apparatus," "smoke helmets" or simply "helmets." The terms applied are often inappropriate, particularly "helmet," because in the approved self-contained mine-rescue apparatus helmets are no longer employed. On the other hand, for fire fighting at close range smoke helmets employing compressed air or connected to an air pump have been used in certain mining districts. For rescue purposes, however, which require the movement of the wearer for a long distance from the base, only self-contained apparatus should be employed. The oxygen-using apparatus is the kind that is receiving the greatest development and the bureau has termed this "oxygen mine-rescue apparatus."

European Rescue Apparatus Still Used

The United States Bureau of Mines at present uses three European types of apparatus—two German and one English—in mine-rescue, mine-fire and mine-recovery operations. However, they are still on probation and consequently do not bear the official approval of the bureau, as do permissible explosives and various types of miners' lamps. No American type of apparatus is used by the bureau in actual field work.

The first oxygen mine-rescue apparatus was invented many years ago in Europe, but the first apparatus was brought into this country by a German agent only in 1908, at which time the Bureau of Mines (then the Technologic Branch of the United States Geological Survey) began to use the apparatus in investigating mine-explosion disasters, and later to demonstrate its use and systematize methods of training miners in mine-rescue work. The Bureau of Mines has also been largely instrumental in introducing to mining companies the best type of apparatus, and today there are thousands used throughout the different coal- and metal-mining districts of this country. Several states have passed laws that compel the mining companies to install oxygen mine-rescue apparatus at their mines and maintain a rescue crew properly trained in its use. Furthermore, the mining companies that have properly equipped crews have in consequence received reductions in their insurance rates. Some of the larger interests have even provided emergency-rescue and fire-fighting cars.

*A paper read before the 44th annual meeting of the International Association of Fire Engineers, Providence, R. I., Aug. 29-31 and Sept. 1, 1916; by permission of the director, U. S. Bureau of Mines.

†Mining engineer, U. S. Bureau of Mines, Pittsburgh, Penn.

The Bureau of Mines operates eight fully equipped mine-rescue cars, five rescue stations and three emergency-rescue automobile trucks in different mining centers of the United States. The first mine-rescue cars used by the bureau were remodeled Pullmans, but the new cars are to be of modern all-steel construction.

Coal and Metal Miners Trained to Use Apparatus

The principle of increased mine safety has been urged in nearly every section of this country through the medium of these rescue cars and stations, and more than 10,000 coal and metal miners in the United States have been trained in the use of oxygen mine-rescue apparatus by employees of the Bureau of Mines during the last eight years. Furthermore, during this same period the bureau rescue men have attended 283 mine disasters. Rescue apparatus was worn by 699 men at these disasters, 92 miners were saved by apparatus men in the service of the bureau, and 768 were saved by other rescuers wearing apparatus. Very few mine explosions or mine fires occur that do not require the services of properly equipped mine-rescue crews.

The primary purpose of oxygen mine-rescue apparatus was to furnish protection to those who ventured into mines filled in whole or in part with poisonous gases, in an effort to rescue those imprisoned. However, the apparatus is now widely used in fighting mine fires and in mine-recovery work, particularly where the ventilation has been affected.

Oxygen mine-rescue apparatus may be likened to any device that is used to insure protection: it is necessary that it be on hand when needed, it is essential that men who use it be properly trained in its use, and it is of great importance that the apparatus be kept in proper working order and in a sanitary condition at all times. The humanitarian viewpoint is, of course, foremost in our minds, but at the same time the actual saving of money through compensation, as well as the preservation of property must not be lost sight of. The latter item alone greatly exceeds that of the initial cost of the apparatus together with the cost of upkeep and training.

Experiments and field tests of oxygen mine-rescue apparatus by the Bureau of Mines have, however, demonstrated that all types of apparatus are, from a physiological standpoint, limited in use; in other words, none of the apparatus will entirely accommodate the physical requirements of a wearer. Thus, as an instance of only one of several defects in the apparatus now used, the manufacturers have usually directed that the oxygen supply should be set at a rate sufficient only for moderate exertion on the part of the wearer. A natural circulation depending upon the respiratory movements of the wearer is altogether preferable.

The oxygen in the air is immediately more essential to the life and activity of a human being than food and water. A self-contained oxygen-breathing apparatus must, therefore, provide the wearer with air that is in every respect similar to normal air and should also entirely meet his physiological requirements. The three types of apparatus used by the Bureau of Mines are

identical in their most important features. Improvements in details are especially necessary in all of them in order to insure greater safety in their use.

The principal features of the present self-contained oxygen mine-rescue apparatus consist of: (1) A rubber bag or bags into and from which the wearer breathes; (2) a steel cylinder or cylinders containing compressed oxygen which is fed automotically into the breathing bag through a reducing valve at a fixed volume per minute; and (3) a regenerating charge carried either loose in the rubber breathing bag or in a specially prepared metal cartridge connected to the bag. In other words, every time the wearer of the apparatus inhales, a small part of the oxygen in that breath is absorbed by the blood and in its stead a small proportion of carbon dioxide is thrown off. The exhaled air containing this carbon dioxide passes through the charge of alkali, which absorbs the impurities; the requisite quantity of oxygen is then automatically supplied in order to bring the next inhalation up to normal condition. In mine-rescue work where a rescue crew is frequently called upon to go a half-mile or so into a poisonous atmosphere, it is necessary that the apparatus have a two-hour capacity, and a self-contained oxygen mine-rescue apparatus is practically the only possible means of supplying regenerated air for such a period.

Designing a New Apparatus

The physicists and engineers of the Bureau of Mines have been engaged in designing a new apparatus that will more fully meet one's physical requirements, and encouraging results have already been obtained. The rate of oxygen supply in the newly designed apparatus will be controlled automatically by the breathing of the wearer, and it will adjust itself with equal readiness during vigorous exertion or while at rest. The United States may be relied upon eventually to manufacture an apparatus that will be superior to those of foreign design now in use.

So far, men in laboratory tests and also in the field have worn oxygen mine-rescue apparatus at intervals from four to six hours a day for periods of several weeks and have not suffered any serious disorders. Of course, every man who is to take part in mine-rescue work should have received a thorough physical examination, particularly of his heart, arteries and kidneys; he should be of fair muscular development, under 40 years of age, not over the average weight for his height, and his arterial pressure when resting should not be more than 135 to 140 mm. of mercury.

The consumption of oxygen by the body is sometimes compared to that of a fire. The analogy, however, can be carried too far. When oxygen is supplied to a flame, the combustion proceeds at a more rapid rate. This is not true when pure oxygen is supplied to the lungs, because one does not consume any more oxygen when breathing air highly enriched in oxygen than when breathing normal air. The quantity that the body demands is wholly determined by physical exertion. The ordinary open flame is extinguished when oxygen in the atmosphere falls below 16½%. The blood of a normal man at sea level is not able to absorb enough oxygen properly to sustain life when the oxygen percentage drops below 13%, and unconsciousness is likely to occur at about 9%. Furthermore, burning and breathing differ in that the former depends mainly on the percentage of available oxygen in relation to other gases present; whereas, in the latter, the lungs depend almost solely upon the oxygen contents of air by weight regardless of other inert gases present.

One notable and important change that the Bureau of Mines has made in several of the types of oxygen mine-rescue apparatus now in use was the discarding of the so-called "helmet" or headpiece. In the case of all of the reported deaths, except one, in this country while using rescue apparatus, helmets were worn. The helmet contains considerable dead space in which foul air is likely to accumulate; it is also cumbersome, obscures the vision and is likely at all times to be jarred free from the face if it accidentally comes in contact with an obstruction. The mouth-breathing form of apparatus is the only type now used by the bureau. Of course this does not refer to a supplementary headgear for protection from heat. Perhaps the next step taken by the bureau in order to increase the safety of the apparatus was to require that all types contain a bypass valve in addition to the reducing valve, in order that the wearer may draw on his oxygen supply at will in case of emergency. In fact, the specifications for the bureau's new apparatus stipulate that there be a bypass attachment, also that in the injector type the injector be placed on the intake side of the regenerating cartridge so as to reduce the course of circulation which is under a negative pressure.

The purpose of this paper is to give merely an elementary discussion of the oxygen mine-rescue apparatus used in this country. It would take pages to discuss in detail all the mechanical and physical features of the apparatus and the numerous tests and experiments that have been carried on by the Bureau of Mines.

Attention is called to the bureau's Technical Paper No. 82, "Oxygen Mine-Rescue Apparatus and Its Physiological Effects on Users." This publication will soon be out of the press and is probably the last word on this particular subject.

The most essential points to be remembered in connection with the apparatus now used by the Bureau of Mines are as follows:

1. The apparatus should be of the one- or two-hour type. Apparatus of smaller capacity can be used only for inspection purposes with the necessary degree of safety. The Bureau of Mines does not use the so-called "half-hour" types of apparatus unless they are equipped with the regulation reducing valve and finimeter.

2. The "helmet" with a seal to cut off the outside gases should be discarded; it should be replaced by a simple mouth-breathing device.

3. A bypass valve should be a part of every apparatus, as it can be used to draw on the oxygen supply at will in case the reducing valve should fail or in other emergencies.

4. In the injector type of apparatus the injector should be placed on the intake side of the regenerating cartridge.

5. No one should be allowed to wear the apparatus until he has passed a severe physical examination and has been thoroughly trained in its use. The manual of training of the Bureau of Mines requires that the apparatus be worn for five 2-hr. periods.

6. The apparatus should be tested weekly to gurantee that it is absolutely air-tight and that the reducing valve is supplying the requisite amount of oxygen per minute.

Extra precautions should be taken in connection with apparatus in which there is a negative pressure circulation; that is, an injector employed to operate the circulatory system artificially.

7. The apparatus should be kept in a sanitary condition.

8. The apparatus should be thoroughly tested immediately prior to its use in an irrespirable atmosphere.

9. The regenerating charge, whether loose in the breathing bag or contained in a specially prepared cartridge, should be inspected carefully before being introduced into the apparatus. Do not expose the regenerating charge to a freezing temperature.

10. No one wearing the apparatus should be allowed to enter alone into an irrespirable atmosphere; the bureau recommends that a rescue crew should consist of five men.

Schools To Train Foremen for Our Chemical Industries*

Within the last 25 years there has been created a growing demand, from industries, for young men with chemical training. As a result of this demand many excellent chemical courses have been established in our universities and technical schools, the graduates from which have found a ready welcome in nearly every line of manufacturing. These young men, for the most part, have been employed as analytical chemists and through hard work and untiring effort have risen to positions of responsibility and trust. The demand for such men has been gradually increasing until at the present time there is hardly a sufficient number available to meet the demands. As our manufacturing processes have become more complicated within recent years, there is another problem that confronts us; that is, the ability to handle these complicated processes in an intelligent manner in the works. In other words, we have come to realize that we must have not only research chemists to work out new processes and technically trained men in our laboratories to test the materials purchased and the products manufactured, but likewise men in our plants who are also technically trained to make these products. That is to say, we must make provision for the training of our foremen. Many a process has been pronounced a failure and many a product ruined, because unintelligent supervision was exercised during the preliminary trials.

That such a condition exists was felt by the trustees of Pratt Institute, and in 1905 a course in applied chemistry was established, which has for its aim the training of young men for foremanship positions in our growing chemical industries. In organizing the work Dr. Allen Rogers[1] attacked the problem from an entirely novel standpoint, as he believed that to train men for factory work required that they be given factory experience. It being impossible to put the student into actual factories, the next best method was adopted—that of building model factories at the school, where the student might handle materials on a scale sufficiently large to approach commercial conditions.

In the original plan five model plants were selected: A soap factory, paint factory, chemical works, dyeing equipment and tannery. Since the inauguration of the course, however, the scope of the work has been greatly enlarged, the equipment in all of the original plants has been materially increased, and several new plants have been installed, including a dry-color and ink works, varnish equipment and an intermediate and dyestuff plant. In working in these model plants the students are assigned in groups, one of the members being foreman. The equipment is of such a character that marketable products can be produced, and being of a high standard, they find a ready sale. The returns from the sale of manufactured articles are sufficient to offset the cost of raw material. During the last year the sales from these manufacturing plants, not counting the material used in the manufacture of other products or sold to other departments of the institute, amounted to over $2,500. By working in the model plant, the student becomes familiar with the handling of machinery, gains experience in the control of men and acquires confidence in his own ability to work with materials that have a money value. He also learns that to spoil a batch of goods means money lost and to make an inferior article lowers the efficiency of his plant. In carrying on this work, the foreman must keep a record of all operations, the cost of raw material, take into account the item of labor, wear and tear of machinery, cost of container and interest on the investment.

The object of the course, as already stated, is to train foremen, and so the instruction is not treated as an engineering problem, the idea being simply to fit young men to handle practically every piece of apparatus or machine found in any chemical manufacturing plant. Since the inauguration of the course the number of applicants for admission has increased from 8 for the first year to over 140 in the last three years. As the number admitted is limited to 35, more than 100 bright young men have to be disappointed each year. Of the 300-odd graduates there are: Managers, 11; assistant managers, 3; superintendents, 18; assistant superintendents, 31; foremen, 66; chief chemists, 16; chemists, 98; in other lines, 6; out of employment, 1; the remainder are employed as inspectors, salesmen or other workers connected with the chemical industry.

Progress in Leather Trades

As an outgrowth of the course in applied chemistry and largely as a result of the efforts of Dr. Rogers, who is considered an authority on leather, courses in tanning and applied leather chemistry were opened at Pratt Institute in 1911. In conducting these courses, the institute has the financial and moral support of the National Association of Tanners and the allied industries, as well as the hearty coöperation of all the leather-trade journals. The majority of students enrolled in these tanning courses come directly from the trades and, on completion of their course, usually return to the plant from which they came. Many plants even send their men and not only meet the expenses of the course, but keep them on the payroll during the time. The tanners of the country realized that the future of their industry depended upon having young men with technical training occupy the positions of responsibility in the plants, and so they appointed a committee and raised the necessary funds to meet the needs. They now realize that in order to place the industry on a still higher plane

*Extracts from material supplied by the American Chemical Society.

[1]Research chemist, Pratt Institute, Brooklyn, N. Y.

it will require the unhampered attention of the research chemist; and another fund is being raised, which will insure the establishment of a very complete research laboratory. This research work will be carried out in conjunction with the tanning course, where the facilities of the best-equipped tanning-school plant in the world will be at the disposal of the research chemist and his staff. The National Association of Tanners, therefore, has done the wise thing by first seeing to it that they had technically trained men in their plants before starting a line of investigation that would eventually find its application in the tannery.

Foreign Trade in Lead and Zinc

Imports of lead during July and August, 1916, are reported by the Department of Commerce, as follows:

Articles and Countries	Contents (Pounds) July	August
Lead ore:		
Canada	58,000	33,800
Mexico	320,686	2,385,663
Chile	731,618	188,160
Colombia	7,697	.....
Peru	171,067	53,694
China	134	.....
Salvador	.....	225
	1,289,202	2,661,542
Lead in base bullion and bullion:		
Peru	16,163	12,723
Mexico	.....	287,993
	16,163	300,716
Lead, pigs, bars and old:		
France	.....	56,160
Canada	.....	12,000
Mexico	446,600	245,424
Barbados	662	1,045
Brazil	.....	142,282
Costa Rica	72	.....
Panama	1,510	.....
Cuba	203	.....
Haiti	1,500	.....
	450,547	456,911

The actual tonnage of lead ore imported in July was 4,062 and in August, 10,093.

The imports of zinc ore amounted to 23,539 tons in July and 36,366 tons in August. The countries of origin and the metal contents (in pounds) were as follows:

Countries	July	August
Italy	.....	5,000,000
Spain	4,088,000	4,981,514
Canada	1,493,000	1,105,600
Guatemala	.....	32,000
Mexico	7,447,053	11,441,549
Colombia	8,744	2,205
China	42,795	.....
Peru	13,546	19,400
Australia	3,765,000	.....
Hong Kong	.....	4,480,860
New Zealand	.....	1,888,051
	16,858,138	28,951,179

Zinc in blocks, pigs, etc., was imported as follows (in pounds):

Countries	July	August
Costa Rica and other British West Indies	10,264	3,938
Cuba	41,183	33,833
Brazil	13,732	.....
Colombia	.....	108,760
	65,179	147,145

Imports of zinc dust in July amounted to 85,408 lb. and in August to 92,948 lb., all from France and Japan. Zinc dust of foreign origin amounting to 52,553 lb. was exported in July and to 62,400 lb. in August.

Exports of lead and zinc during the two months under review were as follows:

	July	August
Lead, pigs, bars, etc.:		
Produced from domestic ore	18,016,865	15,084,104
Produced from foreign ore	3,119,550	896,000
Zinc, pigs, bars, etc.:		
Produced from domestic ore	23,491,422	32,344,106
Produced from foreign ore	9,015,755	9,359,643
Zinc plates and sheets	1,925,392	4,978,592

Precious Stones in 1915

In the chapter on Precious Stones, written for Vol. XXIV of the *Mineral Industry* by Dr. George F. Kunz, the effect of the war is noted, with particular reference to diamonds; the stringent British regulations to prevent industrial stones from getting into German hands; the closing of the mines at the beginning of the war; the gradual increase of American demand with the corresponding increase of price in three jumps totaling over 20% in about three months; and finally the French war measure of May 16, 1916, prohibiting the importation of precious stones, pearls excepted, as a means of limiting the indulgence in luxuries. Paris being a distributing center for pearls, the export trade represents an economic gain. A curious effect of the war is the phenomenal demand in London for cheap diamond rings, with a falling off in the demand for large diamonds.

Official returns from the Mines Department place the total diamond production in the Union of South Africa for 1915 at 103,385.7 carats having a value of £399,810; while in 1913 the production was valued at £11,389,807. Most of the mines ceased operations shortly after the outbreak of the war. Many employees served in the campaign in German Southwest Africa, and the companies cared for the families of such volunteers. Prospecting in Rhodesia disclosed some fissures of kimberlite, and the diamantiferous beds in the Somabula forest have been traced for about 70 mi. northeast from Willoughby's Halt. They contain many gem stones besides diamonds, including chrysoberyl and topaz.

In Brazil diamonds are now reported to have been found in the matrix, the discovery being credited to Dr. Eberhard Rimann, the chief mineralogist and petrographer of the National Geological Institute in Rio de Janeiro since 1912. The states of greatest present importance, as regards diamonds, are Minas Geraes, Bahia, Goyaz and Matto Grosso. In the districts that have been worked, the stream gravels have in some cases been gone over several times and the higher terrace gravels now furnish most of the stones. Dredging operations are not yet successful, but the outlook is good.

Imports of precious stones into the United States in 1915 amounted to $26,521,330, nearly one-half of which value was represented by diamonds, cut but not set.

The American diamond field of Pike County, Arkansas, was practically idle; the watchman of the Arkansas Diamond Co. retrieving 32 stones with a total weight of 17.9 carats. Montana furnished good sapphires, now popular as a gem stone, to the extent of 36,863 carats, and 506,700 carats of culls for industrial use. Turquoise and the less precious stones were not extensively mined, though the pink and red tourmalines of southern California are finding a good market in China.

Appraisement of Zinc

Appraisement of zinc at customs houses has been ordered modified. The Treasury Department has issued this statement in that connection:

"The plan for the appraisement of zinc in ore, published in T. D. 36,446, is hereby modified, to provide that the method therein set forth shall not apply to sulphide ores assaying 40% or less of zinc. The zinc in such ores should be appraised at not less than the contract or purchase price."

Editorials

Copper Smelting and Refining Capacity

We have previously called attention to the similarity of conditions now existing in the copper industry to those that prevailed in the zinc industry about a year ago, when there was a plethora of ore and a scarcity of smelting capacity, conditions that gave the smelters the benefit of extraordinarily large margins, and indeed sometimes rendered it difficult for the producers to dispose of their ore at all. In the zinc industry that situation has been to a large extent corrected by the building of new smelting capacity.

The production of copper at the present time is throttled chiefly by deficiency of refining capacity, to a less extent by deficiency in smelting capacity. There is, thus, a congestion of crude copper that cannot be refined and of ore that cannot be smelted. Some new producers are finding it difficult to dispose of their output. Anbody who has refining or smelting capacity to sell can get for it almost anything that he chooses to ask. We have heard of smelting contracts recently made at a discount of 5c. per lb. of copper.

The smelter who makes such a contract is sure of winning a huge profit. The ore producer is called upon to make a huge sacrifice and may resent it unless he understand the conditions. If he does understand the conditions, he figures that it is much better for him to sell his copper at 22c. per lb. than not to sell it at all. If anybody does not choose to accept such terms, there are lots who are glad to, and the producer who holds out stands the chance of missing the market altogether. The law of demand and supply prevails in the smelting business just as in everything else.

The Metallurgical Advance

The advance of metallurgy during the last few years points more and more decidedly to selective treatment of ores; that is, the segregation of the principal metal-bearing constituents of an ore into a bulk much less than that of the original material by the use of a process costing little to operate. Such a process should logically be called concentration, which is what it really is, but that word has had such a long and honorable use in connection with gravity-water separation that, to avert confusion, it is advisable to avoid its use in another sense. Concentration, then, may be held to be one form of selective ore treatment, in which the bulk of the ore is treated by a cheap process, a residue thrown away and a selected smaller portion further beneficiated by a more costly method. Close examination of former systems of treatment will show that most of them make use of selection in some form, varying from the natural high-grade ores, selected by nature, and progressing through hand-sorting and concentration processes, down to the highly refined fine-concentrating and flotation processes. Consequently it is not surprising that the latest steps have served to reveal more clearly the tendency of modern ore treatment.

To put the statement in another form, it might be said that elimination of portions of the ore should begin as soon as possible after treatment begins. Thus, at the sorting table, manifestly worthless rock is extracted and thrown away. And similarly in jigging, table concentration and other systems, valueless portions of the rock may be selected for rejection, leaving more concentrated portions to be acted upon by the costlier processes of regrinding, concentrating, amalgamating, floating or whatever other method may seem applicable. Of course the extremes of total absence of value and total absence of everything but value can hardly be reached. Even the most barren-looking rock probably contains some metal, and even the bullion bar contains foreign material that must be removed later by refining processes. But the desired conditions can be approximated, and residues of no immediate commercial value can be rejected at appropriate stages in the process. Flotation has done much to clarify the ideas of the desiderata of metallurgy. Certainly it seems now to be generally conceded that the treatment of the large bulk of ore by an inexpensive, not highly efficient method to produce a small, selected portion that can be further treated by a more expensive and efficient method constituting the final step is the procedure that will, all things considered, be most satisfactory.

Selling Custom Ore

A Colorado local paper told recently of the experience of a small ore producer in Gilpin County, who shipped a carload (about 25 tons) of ore to the American Smelting and Refining Co. at Denver. The consignment was refused as worthless by the smelting company, owing to its high content of zinc, the assay of the ore being 1.175 oz. gold, 11.7 oz. silver and 23.2% zinc. The ore having been refused by the smelter, a public sampling and ore-buying concern was asked to make a bid. It offered $1 per ton. The consigner of the ore then ordered it shipped back to Black Hawk. Upon arrival there, the Colorado & Southern Ry. rendered a freight bill of $196.40. The local Mine Operators' Association then came to the assistance of the unfortunate producer and secured from the railway a large reduction of its charges, after which the ore was sold to a local ore-buying concern for the net sum of $386.72.

The local paper from which we derive the above facts characterized the affair as "a raw deal." In so far as the railway company was concerned, it certainly was, a charge of $4 per ton from Black Hawk to Denver being exorbitant. The smelter was, of course, perfectly within its rights in refusing to buy the ore if it did not want it. In shipping the ore without previously finding out where it was marketable, the consignor took chances. Nevertheless those are chances that the small producer takes habitually, and often to his disadvantage, for the

ore once delivered to the smelter, a loss—perhaps large—is involved in taking it away, and the consignor is therefore generally constrained to accept unfavorable terms.

The remedy for such unfortunate occurrences is greater publicity respecting the ore market. The producer who makes a consignment ought, of course, previously to find out by inquiry respecting the probable terms, but many will neglect to do that. The current terms, however, of various kinds could be published in a general way so that producers might have some idea of the market, just as does the farmer when he ships potatoes or pigs to a commission merchant.

A New Brood of Wildcats

The great interest at the present time in the production of ores and metals naturally stimulates interest in the development of prospects, which inspire hope of the uncovering of a new bonanza. Such a story as that of United Verde Extension kindles imagination and makes easy the promotion of "prospects" in the vicinity. So it is in other mining districts. And so it is also that fraudulent promoters quickly and naturally take advantage of their new opportunities.

An esteemed correspondent in Arizona, which is one of the livest of mining states, writes us on the subject as follows: "Incidentally I am wondering what the United States Post Office authorities are doing respecting the prosecution of persons who are using the mails for fraudulent purposes. We have, in our immediate vicinity, several companies that are issuing literature which certainly should be brought to the attention of prosecuting attorneys; yet so far as I know, nothing is being done toward putting the 'soft pedal' on these people. It is a great pity that the present high prices of metal and the general boom in the mining industry are assisting the operations of some of the worst swindlers that I have ever come across. I wish there was some way of stirring the Post Office authorities into activity. I have tried to do this, personally, in one instance, but did not get any results at all. I wonder if the time be not ripe for some strenuous efforts to be made by responsible mining men and the journals that represent them, so as to curb the activities of persons who are stock swindlers, pure and simple, and whose present activities will certainly be to the damage and detriment of all legitimate mining."

We hope that the daily press will take notice. If the daily papers will refuse to prostitute their advertising pages, the swindlers will not get very far. However, they will catch thousands of the unwary by means of their circulars and other representations. For these the Post Office authorities should be on the lookout. It is the duty of every good citizen who knows the facts to apprise the authorities of wildcats emanating from their district. Otherwise the Post Office authorities will not know that action is necessary. If, after receiving such information, they neglect to act, the blame will be theirs.

Production of Spelter Abroad

Bits of evidence showing how the production of zinc is increasing in many parts of the world are constantly appearing. Thus, the official report of the production of ores and metals in Sweden shows that the electrothermic smeltery at Trolhättan produced 8,588 metric tons of spelter in 1915, compared with 2,300 tons in 1914. The electrothermic smeltery at Sarpsborg, in Norway, also made a largely increased production, but to the major extent (if not wholly) its output consisted of refined spelter produced from common spelter shipped thither from Great Britain.

Outside of the United States the most spectacular increase in spelter production is occurring in Japan, whose smelters are now supplying the major part of the Japanese consumption. Inasmuch as only a few years ago Japan imported all her spelter, the obtaining of her own supply releases, of course, capacity in other parts of the world.

China has been exporting a small tonnage of spelter—probably the output of native smelters—and Canada is now making a small production of electrolytic spelter. The new, large zinc smeltery at Ekibastus, in Siberia, is probably in operation by this time. The zinc smelters of both France and Great Britain have increased their output. While these additions to the world's production are occurring in driblets, as compared with what happened in the United States, nevertheless their aggregate is considerable. The swelling foreign supply is undoubtedly playing an important part in the spelter market.

The new conditions are helping to relieve the zinc situation in Australia, where, upon the outbreak of the war, an anuual output of about 400,000 tons of concentrates, the great bulk of which formerly went to Germany and Belgium, was cut off from their market. Later, a relatively small proportion thereof was sold in the United States, shipments of which have been received by American smelters during the last year. Later still, an additional market was found in Japan. Finally, the British government agreed to purchase 100,000 tons per annum during the war and the same quantity yearly for 10 years after the war.

In the meanwhile important plans to increase the spelter production in Australia have been instituted—especially through the erection of a large electrolytic plant in Tasmania—and the British government has agreed to purchase for 10 years 45,000 tons per annum of spelter produced in Australia. However, the production of electrolytic spelter in Tasmania can hardly begin before the latter part of 1917, and it will probably be a long time before that plant, together with the smeltery at Port Pirie, will be able to produce 45,000 tons of spelter per annum.

The reports from the lead refineries of diminishing output owing to increasing inefficiency of labor are but another sign of the times. Prosperity—which means high wages and continuous work—generally breeds slackness and indifference to control. This comes soonest in evidence in the metallurgical industry in those branches of work wherein the human factor is highest; for example, in zinc smelting and lead refining. In copper smelting, wherein the machine and the furnace are preëminent, it is of least effect. The greatest menace to American welfare is the growing lack of thrift, or what is the same thing—the growing tendency to waste, whether it be of material or time.

How long are citizens enlisted in the National Guard to be kept on the Mexican border while their patriotic and generous employers pay their wages and salaries?

BY THE WAY

The report of the Bureau of Statistics of the State Department of Labor that wages in the factories of New York have advanced on the average by 45% during the two years of the war indicates that labor is participating with capital in the great prosperity of the United States.

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A Butte miner who had a job in the New York subway was met on Broadway by a Western friend, who asked him what he was doing there. He replied: "Working in a sort of a parlor. I put in a shot and a dago comes in and mucks it out, and when I feel like it I go back and put in another. They call it working, but you could eat it. Talk about blasting! It sounds like a Fourth of July firecracker."

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There happened to be in San Francisco recently seven of the technical staff of the Pueblo Smelting and Refining Co. of 30 years ago, and appropriately, they got together at dinner. They were Baron von der Ropp and E. N. Englehart, formerly at the old lower works in Anaconda; H. H. Schlapp of Broken Hill fame, now a resident of Melbourne, Australia; Philip S. Morse, formerly of Cockle Creek, Australia; August Raht, who built the East Helena smeltery; George Westcott, who has abandoned assaying for fruit raising, and E. P. Mathewson.

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According to the report of the Werchisset Mining Co., it appears that the copper industry of the Ural has been compelled to reduce its production on account of shortage of labor, of difficulties of transport, and owing to the impossibility of obtaining sufficient coke from the Donetz district, says *Engineering,* London, Aug. 18, 1916. The cost of production has increased, but prices were fixed by a long-running contract with the Copper Syndicate, Medj. The Russian banks appear to be much interested in the Ural mining and metallurgical undertakings, and are by degrees acquiring a number of shares in these concerns. Thus the Union Bank of Moscow has acquired the majority of the shares in the Alepajew Metallurgical Works, which has a capital of 5,880,000 roubles. This is one of the oldest concerns in the Ural and manufactures pig iron and half-finished products.

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The Jerome boom gathers momentum as it progresses. "There seems to be no limit to the spots," writes an Arizona correspondent, "upon which a million-dollar corporation can be formed overnight. And they are being as quickly formed. Of course the 'home folks' take the first 100,000 shares at 10c., while the outside world hungrily awaits the issuance of the second 100,000 shares at $1 a share. Thus it goes. Nearly every man, woman and child in Jerome has an armful of stocks and is accumulating more hourly. The preachers put their savings behind their faith and fill their coffers with the filthy lucre between Sabbaths. Stenographers vie with their employers for prestige on the 'Change, and schoolteachers keep one eye on the stock ticker and one on the blackboard. One cannot distinguish between common street loafers and malefactors of great wealth, and the swamper is a financier of much renown. Verily it is a jolly good camp —and profiting."

The following letter from a young engineer who is doing good work for himself and for his community with very small means is of peculiar interest: "I was glad to get the information about the —— ——. I do not believe that you can work that hard rock by hand. I also think that small air installations can be put in cheaply. I have been waiting to see how the —— was going to turn out. The installation is more than a success. It is some layout. We bought an old Oakland auto engine supposed to be 35 hp. We paid $150 for engine and transmission. We set this on a frame of 8x8 and connected a piece of $2\frac{3}{16}$-in. shaft directly to the end of the transmission. Off this shaft we drive a 72-cu.ft. compressor and a pump to cool the engine. On the end of the shaft is a pinion that drives the hoist. The hoist pulls out of the mine about 1,200 ft., and then we attach another cable to pull up the hill. The hill is 1,300 ft. long. The maximum grade is 50%. We have a bin at the top where the self-dumping skip unloads. We put a new carburetor and magneto on the engine and then it went fine. We are going to try kerosene after we run awhile. I believe that we can take the 72-ft. compressor that we have and put it on a truck. This truck could carry the Shaw sharpener, jackhamer, etc. I planned on getting an 8-16 Mogul tractor made by the International Harvester Co. to drive the same, using the tractor as a stationary engine and also to haul ore. With a layout like this, I believe that you can make a profit out of lots of places where old timers had to quit." To a young fellow who is showing such ingenuity and resourcefulness, we say, "More power to his elbow."

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The Anaconda *Standard* remarked fittingly that the announcement of E. P. Mathewson that he is to leave Anaconda was received with deep regret, not only in the city for which he has done so much in all civic lines, but throughout the state, where he has taken a foremost interest in every coöperative effort for the common good. His personality is stamped upon institutions of which Anaconda is most proud—the whole movement centering in playground activities, the sports on the common, the Christmas celebrations and other holiday observances; the library; the good-roads system, and many another undertaking that is significant of progress. In his official capacity he has had the confidence of the entire community as well as of the company he has represented here. Throughout the state he was recognized as a tireless worker for the upbuilding of the best in Montana. He was chairman of the state fish and game commission, and from the first has been at the head of the good-roads and automobile organization of the state. The attractiveness which Montana has for tourists is the result largely of his activity in these two capacities. He has been an enthusiastic worker for the state fair and other organizations of the kind, and his presence will be sorely missed in every aggregation of loyal boosters. He leaves Montana with the best wishes of every citizen for his prosperity in his new field of usefulness, and the assurance that he will always be welcomed back, whether it be for a temporary visit or to make the state his permanent home if he finds the longing for return irresistible. The *Journal* adds to this that Mr. Mathewson in Montana has been not only a distinguished metallurgist and a great administrator, but also a good citizen.

Personals

John Seward has returned to Nutley, N. J., from Ontario.

L. W. Kemp, lately at Grass Valley, Calif., is now at the Chuquiçamata mine in Chile.

A. P. Rogers has just returned to New York from a professional trip in Dutch Guiana.

Mill Superintendent Eames, of the Hollinger Mine in Ontario was in New York last week.

C. H. Macnutt has obtained a commission in the Royal Canadian Engineers, Canadian Expeditionary Force.

John F. Boyle has been elected president of the Arkansas & Arizona Copper Co. He succeeds C. W. Clark, resigned.

Richard A. Parker has been elected chairman of the mining bureau of the Denver Civic and Commercial Association.

Charles W. Newton, manager of the Consolidated Interstate Callahan mines at Wallace, Idaho, was in Boise on business recently.

J. Reddington, who has been in charge of development work at the Moose mine, Gold Lake, Manitoba, has returned to New York.

Robert McGarraugh, formerly mine superintendent of the Aguacate mines in Costa Rica, has been appointed general superintendent in charge of operations at the mines.

Persifor G. Spilsbury, general manager of the Aguacate mines, Costa Rica, has been transferred to New York and will have his offices at 55 Liberty St., New York.

G. A. White, formerly metallurgist of the American Sheet and Tin Plate Co., is now associated with the Titanium Alloy Manufacturing Co., of Niagara Falls, in the same capacity.

Frederick Laist, formerly metallurgical manager for the Anaconda Copper Mining Co., has been appointed the successor of E. P. Mathewson, who has just left the Anaconda company.

J. N. Bulkley, 120 Broadway, New York, has been appointed consulting engineer to the Kaolin Products Corporation, and will design and supervise the erection of the new plant.

J. L. McAllen has resigned his position as superintendent of the Gold Bullion mine at Knik in the Willow Creek District, Alaska, and will engage in private practice in Portland, Ore.

W. H. Wright, of the Malm-Wolf Co., Denver, Colo., sailed from Nome on Oct. 7 for Seattle. During the past month Mr. Wright has been making placer investigations in Alaska for New York parties.

John V. N. Dorr and **Carl E. Akeley** have been awarded the John Scott Legacy Medals and premiums by the Franklin Institute of Philadelphia; Mr. Dorr for his hydrometallurgical apparatus, and Mr. Akeley for his cement gun.

W. F. Ridley, superintendent of the Allouez and Centennial copper mines in Michigan, was seriously injured while at work underground recently, losing three toes on his left foot and receiving serious injuries about the head and face.

Edward Ray Weidlein has been appointed associate director of the Mellon Institute of Industrial Research of the University of Pittsburgh. Mr. Weidlein has held an industrial fellowship since 1910, and during the past four years has been in active charge of the hydrometallurgical investigations of the institute.

Will L. Clark, manager of the United Verde Copper Co. since 1904, has resigned that position. He is succeeded by Robert E. Tally, who for the last eight years has been superintendent of mines for the United Verde company, and is now to have the title of assistant general manager. For the present he will continue also to act as superintendent of mines.

L. P. Yandell has been elected a director in the Stanton copper companies—Mohawk, Wolverine, White Pine Extension and Michigan. Mr. Yandell is the manager of the estate of the late Joseph E. Gay, for many years heavily interested with the Stantons in all their properties. He has visited the Michigan and has a close working knowledge of the conditions at the various mines.

F. N. Flynn, for the past seven years connected with the Arizona Copper Co., Ltd., at Clifton, Ariz., has resigned his position as superintendent of the smelting department, effective Oct. 31. **Roger H. Hatchett,** who has been Mr. Flynn's assistant for six years past, has been appointed acting superintendent of the smelting department. Mr. Flynn will sail from New York early in November, for Chuquicamata, Chile, where he will enter the employ of the Chile Exploration Co.

Obituary

Lyman B. Brainard, president Hartford Steam Boil Inspection and Insurance Co., Hartford, Conn., died suddenly Oct. 11 of apoplexy, aged 60 years. He was also a director in a number of large corporations.

Levi Leonard Conant, professor of mathematics at Worcester Polytechnic Institute, Worcester, Mass., was killed Oct. 11 by an automobile truck which ran over him. He was born in Middletown, Mass., in 1857, and was graduated from Dartmouth in 1879. He was professor of mathematics in the South Dakota School of Mines 1887-90, removing to Worcester in 1891. From 1911 to 1913 he was acting president of Worcester Polytechnic Institute.

Lewis F. Jones, a mining engineer, sent to Barrackville, W. Va., in charge of a crew from the Pittsburgh station of the Bureau of Mines, to rescue the entombed men at the Jamison mine, was asphyxiated in the workings Oct. 21. Jones, with seven other men, had reached the bottom of the shaft when he was overcome. His companions, advancing to the rescue, felt the force of the gas, and one by one dropped in their tracks. When they did not return to the surface another party entered the mine and brought them out. All quickly recovered except Jones, who had apparently died in the mine. He is the fourth Government expert to lose his life in an attempt to save entombed miners. His death was a great loss, as he was regarded as one of the most able men in directing rescue work. Mr. Jones had charge of the experimental mine of the bureau at Bruceton, Penn., and in this capacity developed many safeguards for the protection of life in mines.

Ranks of Colorado's pioneer mining men have been thinned by the recent deaths of **Col. George G. Vivian, A. R. Gumaer, Charles W. Marshall** and **Fred W. Cammann.** Vivian was the last survivor of the so-called "Swansea Group" of men who were instrumental in establishing several early smelting plants in the state. He was born in Cornwall 61 years ago and came to this country with Pierce, Dumont, and others. At times he managed the Champion, Koohinor and Donaldson mines at Idaho Springs, the smeltery at Golden and the Hidalgo mine near Mexico City. For the past three years he managed the East Butte Copper Co. at Butte, Mont. Gumaer was president of the Florence Oil and Refining Co. and always held numerous mining interests. His death was due to pneumonia. Marshall was stricken with apoplexy while driving to his mining property in Bummer's Gulch, Boulder County. Cammann held properties, at various periods, in the Leadville, Gunnison, Silverton and Central City districts. Heart failure attacked him while visiting his son in Cleveland, Ohio.

Societies

University of Illinois—The number of students registered in the College of Engineering at Urbana, Ill., is 1,143 this term.

University of Arizona—This institution at Tucson will give this winter a number of short courses intended for men working in the mine or smelting plant. These courses include Prospecting; Field Geology; Assaying; Metallurgy; Flotation; Mine Management.

Mining and Metallurgical Society of America—A meeting of the New York Section was held at the Engineers' Club on Oct. 19. W. R. Ingalls having declined to accept the chairmanship of the section to which he was elected at a previous meeting, Morril B. Spaulding was elected to fill that office. Prof. Benjamin Leroy Miller addressed the meting on the subject of "Iron and Manganese Deposits of Brazil."

Haileybury School of Mines—The new mining and milling laboratory at Haileybury, Ont., is nearing completion and the school is now getting the machinery and equipment. The laboratory will comprise a complete small size concentrator, cyanide mill, flotation plant, assay office, blacksmith shop, machine shop and carpenter shop and will contain most of the machines usually met with in these lines. The school has the coöperation of the mines of the Cobalt district and of manufacturers of mining machinery.

Industrial News

H. W. Dow has been appointed sales manager of the Nordberg Manufacturing Co., of Milwaukee, Wis. Mr. Dow has been associated with the company in the engineering and sales departments for 12 years.

Trade Catalogs

Erie Volute Centrifugal Pumps. Erie Pump and Equipment Co., Erie, Penn. Catalog No. 32. Pp. 32. 6x9 in. Illustrated.

Roller Bearings. Hyatt Roller Bearing Co., Newark, N. J. Bulletin No. 307. Pp. 24; 7x10 in. Illustrated. This covers the application of roller bearings to mine cars.

Encyclopedia of Goodyear Mechanical Rubber Goods. The Goodyear Tire and Rubber Co., Akron, Ohio. Pp. 40. 7½x10½ in.

This is the title of a set of bound bulletins containing tabulations of the mechanical rubber goods made by this company and information as to their use.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

CONCENTRATING—Ore-Concentrating Apparatus. Thomas A. Janney, Garfield, Utah. (U. S. No. 1,201,053; Oct. 10, 1916.)

CRUCIBLE FURNACES—Improvements Relating to Crucible Furnaces. E. Hall, Birmingham, Eng. (Brit. No. 4,991 of 1915.)

CRUSHER—Ore Crusher and Concentrator. Charles O. Haskell, Los Angeles, Calif., assignor to Centrifugal Machinery Co., Los Angeles, Calif. (U. S. No. 1,200,104; Oct. 3, 1916.)

CRUSHING—Improvements in Crushing, Grinding and Pulverizing Machines. W. H. Coward, Somerset, Eng. (Brit. No. 735 of 1915.)

CONCENTRATOR—Ore Concentrator. George T. Cooley, Joplin, Mo., assignor of one-half to James Athel Brent, San Francisco, Calif. (U. S. No. 1,201,151; Oct. 10, 1916.)

DRILL—Rock Drill. August Gerdes, Gretna, La. (U. S. No. 1,200,935; Oct. 10, 1916.)

ELECTRIC FURNACE. Horace W. Gillett and James M. Lohr, Ithaca, N. Y. (U. S. Nos. 1,201,224 and 1,201,225; Oct. 10, 1916.)

ELECTRIC FURNACES—Improvements in or Relating to Electric Furnaces. E. K. Scott, Kent, Eng., and F. Howles, Manchester, Eng. (Brit. No. 3,953 of 1915.)

ELECTROLYSIS—Process of Recovering Metals. Charles J. Reed, Glenside, Penn. (U. S. No. 1,200,025; Oct. 3, 1916.)

FUEL—Process of Burning Powdered Coal and Analogous Fuel. Edward P. Roberts, Cleveland, Ohio. (U. S. No. 1,200,028; Oct. 3, 1916.)

FURNACES—Improvements in and Relating to Furnaces for Melting, Oxidizing and Volatilizing Metals. W. H. Boorne and J. Sackett, London, Eng. Brit. No. 7,072 of 1915.)

FURNACES—Improvements in or in Connection with Rotary Furnaces. F. W. Stevenson, Coventry, England. (Brit. No. 6,433 of 1915.)

RETORT DISCHARGING—Improved Means for Discharging Retorts. Gibbons Bros., Ltd., Stafford, Eng. (Brit. No. 10,058 of 1915.)

RETORT-DISCHARGING MACHINES. Simmonds Engineering Co., Iola, Kan. (Brit. No. 3,147 of 1915.)

ROASTING—Improvements in Securing Rabble Arms to Shafts of Metallurgical Furnaces. Furnace Patent Co., Philadelphia, Penn. (Brit. No. 16,939 of 1915.)

SIGNALING—Improvements in Mine and Other Electric Signaling Systems. Sterling Telephone and Electric Co., London, Eng. (Brit. No. 4,675 of 1915.)

Assessments

Company	Delinq.	Sale	Amt.
Alpha, Nev.	Oct. 25	Nov. 15	$0.03
Andes, Nev.	Oct. 11	Nov. 1	0.02
Big Cottonwood, Utah.	Nov. 6	Nov. 24	0.01
Blue Bell, Ida.	Oct. 9	Nov. 9	0.002
Blue Bull, Nev.	Oct. 16	Nov. 20	0.01
Blue Star, Ida.	Sept. 25	Nov. 21	0.02
Cedar Creek, Ida.	Oct. 23	Nov. 23	0.01
Chief Cons. Ext., Utah.	Oct. 10	Nov. 1	0.002
Columbus-Rexall, Utah.	Oct. 27	Nov. 17	0.02
Confidence Silver, Nev.	Nov. 8	Nov. 29	0.10
Cornet, Ida.	Oct. 20	Nov. 20	0.00075
Consolidated Imperial, Nev.	Oct. 25	Nov. 15	0.01
Demijohn, Utah.	Oct. 21	Nov. 10	0.005
Diam. Blk., Butte, Nev.	Oct. 12	Nov. 18	0.01
Diamondfield Bl'k B'tte, Nev.	Oct. 12	Nov. 18	0.01
Duluth, Ida.	Oct. 18	Nov. 18	0.001
Eagle Mountain, Ida.	Oct. 2	Nov. 4	0.001
Emerald, Utah.	Oct. 16	Nov. 18	0.00½
Emerald, Utah.	Nov. 15	Dec. 9	0.00½
Enterprise, Ida.	Oct. 19	Nov. 20	0.002
Four Timber, Ida.	Oct. 1	Nov. 1	0.002
Friend, Ida.	Oct. 21	Nov. 24	0.002
Giant, Ida.	Oct. 5	Nov. 9	0.003
Hale and Norcross, Nev.	Nov. 8	Nov. 20	0.03
Idaho & L. A., Ida.	Oct. 16	Nov. 17	0.005
Idaho Mont, Ida.	Oct. 30	Nov. 18	0.002
Independent, Ida.	Oct. 7	Nov. 7	0.005
Lehi Tintic, Utah.	Nov. 8	Dec. 2	0.0025
Manhattan Cons., Nev.	Oct. 9	Nov. 8	0.01
Military, Ida.	Oct. 25	Nov. 25	0.00025
Mineral Range Gold, Utah.	Oct. 16	Nov. 8	0.005
Monarch-Pgh., Nev.	Oct. 23	Nov. 27	0.01
Murray Copper, Utah.	Oct. 9	Nov. 8	0.001
Naildriver, Utah.	Nov. 4	Dec. 4	0.01
Native Silver, Mont.	Oct. 2	Nov. 4	0.005
Ninemile, Ida.	Nov. 2	Nov. 17	0.0015
Nonpareil, Ida.	Oct. 23	Nov. 23	0.001
North Cliff, Utah.	Oct. 10	Nov. 3	0.01
North Franklin, Ida.	June 19	Nov. 23	0.005
North Tintic, Utah.	Oct. 10	Nov. 1	0.002
Ophir, Nev.	Oct. 25	Nov. 15	0.05
Raven, Ida.	Oct. 23	Nov. 20	0.001
Seg. Belcher & Midas, Nev.	Oct. 30	Nov. 24	0.02
Selma, Utah.	Nov. 4	Nov. 23	0.005
Sierra Nevada, Nev.	Oct. 12	Nov. 2	0.10
Silver Mt., Ida.	Oct. 21	Nov. 24	0.002
Spearhead, Nev.	Oct. 2	Nov. 2	0.01
Tobar, Utah.	Nov. 2	Nov. 23	0.002
Tyler, Ida.	Oct. 12	Nov. 13	0.0015
Utah Arizona, Ariz.	Oct. 31	Nov. 25	0.005
Utah Metals, Utah.	Oct. 23	Nov. 18	0.002
Wasatch Marble, Utah.	Sept. 26	Nov. 11	0.03
Zuma, Utah.	Oct. 30	Nov. 30	0.005

Editorial Correspondence

SAN FRANCISCO—Oct. 20

Lawson Adit Construction has been started by mining students of the University of California. This pierces the hillside just east of the Hearst Memorial Mining Building on the campus at Berkeley, and will be driven by the students 1,800 ft. into the Berkeley Hills. The primary purpose of Frank H. Probert, recently appointed Professor of Mining in the University of California, in this work is to give every mining student thorough acquaintance with all the mechanical processes of drilling, blasting, timbering, mine surveying, etc., without the great waste of time involved in learning such things by working as a laborer in a mine. Different types of mine timbering and different underground procedures will be illustrated in this Lawson adit. Many sessions of classes of mining students will be held there underground, in addition to the practical work which will be carried on.

Death of a Striker in Amador County resulted from an effort of the strikers to halt a motor car driven by an engineer going to his work as watchman at the South Eureka mine. The engineer is said to have tried to avoid the men who tried to stop his car, but one of the strikers is reported to have deliberately jumped in front of the moving car and was fatally injured. The South Eureka and Central Eureka, which adjoin, are being kept clear of water and the impression obtained is that these mines are preparing to resume operation. Possibly they are, provided the former employees are ready to return at the old wage and without regard to any demands of the union. Very likely all of the mines will resume if their men will go back to work on the same conditions. It is quite evident they will never go back under any other conditions. It is up to the men who are desirous of returning to work. There are about 1,000 of them, and among the 300 strikers there are possibly 100 ready to make trouble. They have taken on a little more bravado since the State Federation of Labor has endorsed the strike. Early in the strike the sheriff appointed deputies among the strikers who were informed they would be expected to maintain order among themselves. It was nice of the sheriff to do this, though he was no doubt aware that he was putting a club in their hands. The secretary of the union says he cannot control the men. That was evident in the beginning, when he claimed that the major part of the union members did not wish to strike, but the Austrians and the Spaniards and some other foreign members had their way. About 250 of them seemed to have controlled the situation, and, as Sheriff Lucot expressed it, the law-abiding element, which is anxious to be at work and does not approve the strike, got discouraged when it came to the pinch of protecting themselves against the lawless ones. Then the sheriff asked the governor to send help. The governor sent the labor commissioner to investigate, and his investigation consisted chiefly in trying to persuade the mine managers to take the men back on three months' probation with the promise that those who were good and worthy should receive the extra two-bits a day. The suggestion was declined, of course. The engineers and the pumpmen, who in the beginning were not called upon to remain away from work, were called out during the past week but had returned to work about the time the accident occurred resulting in the death of one of the strikers. The union, which is a branch of the Western Federation (not the United or Union Federation, as erroneously stated), seems to base its hope of winning the strike upon the exodus of a number of miners who were satisfied with the wage and the conditions, but who were not willing to remain idle while a useless strike was being carried on. The strike will be settled when the miners who claim to have no part in it are ready to go to work in a body and ignore the strikers and their demands.

BUTTE—Oct. 21

Butte and London Cavein that stopped work in the south crosscut has been cleaned up and work resumed. In drifting on the ledge encountered just before the cavein took place, good copper ore was encountered. The ore shows copper pyrites and is the best sample yet encountered. The extent of ore cannot be determined until further drifting is done, but every indication is now that a good orebody has been encountered that will assay high in both copper and silver and will develop commercial ore. This is the first of the seven veins encountered in the crosscutting on the 1,600-ft. level of the Butte and London that has given the company a feeling of certainty of success.

North Butte Quarterly Report for the period ending Sept. 30, 1916, shows a production of 124,488 tons of ore from which were recovered 5,953,685 lb. of copper, 247,833 oz. of silver and 402 oz. of gold. This shows a considerable decrease from the record established in the quarter ending June 30, 1916 when from 146,190 tons of ore were recovered 6,074,742 lb. of copper, 264,400 oz. silver and 442 oz. gold, but an approximation to the normal output for the period ending Sept. 30, 1915, when from 123,500 tons mined were recovered 5,672,890 lb. copper, 265,855 oz. of silver and 305 oz. of gold.

Boston & Corbin Recent Mill Changes and flotation addition are responsible for greatly increased recoveries as shown by the following figures: August ore tonnage, 2,808, recovery, 49,815 lb. of copper and 2,723 oz. of silver. September ore tonnage 2,695, recovery, 53,622 lb. of copper and 3,570 oz. of silver. For the first two weeks of October the tonnage was 1,429, mill recovery, 32,000 lb. of copper and 2,117 oz. of silver. On the assumption that the grade of ore mined in October was about the same as that in August the apparent increased recoveries effected in October were 28.5% of copper and 55.5% of silver over those of August before the mill changes were made.

Butte Millionaire Will Give Two Millions to benefit war orphans and destitute families in France. According to close friends of W. A. Clark, Jr., of Butte, son of former Senator W. A. Clark, Mr. Clark is to give the total profits of his sale of war materials and receipts from investments in "war babies" or bonds from the European governments involved in the present stupenduous struggle. According to the present plans the funds will not pour into France until peace is declared. It is understood a fund will be established which will be handled under the supervision of the American ambassador to France. Mr. Clark's Butte interests are largely comprised in the Elm Orlu zinc mine and the concentrator of the Timber Butte Milling Co., of which he is president and general manager, and which, due to the high price of spelter, have netted profits far exceeding the earnings under normal conditions. Owing to Mr. Clark's absence from the city, the report of his generous intentions, announced by his friends, could not be verified.

Davis-Daly Copper and Butte-Detroit have arranged for the use of the latter's mill for the treatment of the zinc ores in the Colorado mine of the Davis-Daly company. While it was not generally known that the Davis-Daly had zinc deposits of value, the statement is made that there is quite a large quantity of it in the upper levels of the Colorado. The concentrator of the Butte-Detroit has been remodeled for operations. An oil flotation system has been installed similar to that employed by the Butte & Superior and Timber Butte. It is stated that the Davis-Daly company is expected to furnish from 100 to 150 tons of ore for the Butte-Detroit concentrator daily. The ore has been tested both in Butte and Salt Lake oil flotation plants, and it is said that a very high percentage of recovery is made. Aside from reconstructing the concentrator, the Butte-Detroit has not been pushing work at its property. The mine was unwatered several months ago and since then has been kept unwatered preparatory to a campaign of shaft sinking and development.

DENVER—Oct. 20

At the Harvard Shaft, recently drained by the U. S. Exploration, Mining and Reduction Co. (this particular branch of this company's activities being known as the Leadville Unit), the permanent underground pump station is completed and the machinery installed, this including two Krogh pumps of 600 gal. capacity each and one Byron Jackson pump for emergency.

Grasselli Chemical vs. Western Zinc is a case just filed in the Federal District Court for Colorado. Plaintiff alleges that defendant failed to live up to contract to deliver 200 tons monthly of zinc oxide when prices of zinc began to soar, and as a result the Grasselli company was obliged to spend $13,560 more for its necessary raw material than its contract price with the Leadville company.

Radium Mining that has been practically at a standstill since the beginning of the European War, is being resumed by the Standard Chemical Co., which will immediately start new operations in its Paradox Valley properties, Montrose County. The carnotite ore will be produced from perhaps 8 or 10 mines and the ore, after concentration in the company's new mill, will be shipped to Pittsburgh for final reduction.

Tungsten Mining in Boulder County is not to cease simply because the market has dropped considerably. Tungsten Mountain Mines Co., in which H. L. Barber, of Chicago, is the heaviest owner, held its annual stockholders' meeting last week in Boulder and plans were laid for continued operations, including the pushing of the long development adit. New officers are: J. G. Clark, president and manager; L. R. Means, vice-president; S. A. Greenwood, secretary and treasurer.

Downtown Mines Co. has installed its permanent station pumps at the foot of the Penrose shaft, Leadville. The Wolftone mine is now drained to the bottom of the shaft, unwatering having recently been done in coöperation with pumping in the neighboring Greenback shaft. With the new mining depth created by this drainage, extensive development of virgin ground is planned for the Wolftone, Greenback, Pyrenees, Emmet and McCormick mines.

Colorado Fuel and Iron Co. held its annual meeting in Denver recently. Officers' reports showed gross earnings for the past year to have been $25,626,605, an increase over the previous year of about 54%. Operating expenses showed a gain of 43.7%. Net earnings were $4,346,086, but income from other sources brought the profits up to $4,971,076. During the year dividends amounting to 30% on the preferred stock were distributed. A byproduct coking plant of 120 ovens was authorized to be erected at the Minnequa steel works, Pueblo, the estimated costs of this and numerous other proposed improvements being $3,300,000.

Kokomo Is Forging to the Front Again. The formations there are similar to those at Leadville and the variety of metals found is nearly as great. Zinc-sulphide is being mined in quantities from mines that were closed down years ago because of the penalties exacted for zinc in the gold-silver ores. Interest has lately centered in the production of good silver ore from a claim being worked by a group of Denver men, who style themselves the Mutual Corporation, and of which Hugh Steele, one of Denver's pioneers, is president. The company's ground adjoins the Queen of the West that was famous in the early '60's.

Recognition of the Union is topic for discussion among Leadville mining men and merchants. For some time grumbling has emanated from union sources, evidently paving the way for an exaction of an increase in wages and the restoration of unionism in the district. The substantial men in the district remember too well the expensive and bloody task that eliminated the unions years ago and they do not propose any return to former labor conditions. A short time ago the superintendents of two prominent mines dismissed a number of miners who were openly working for the union. The State Industrial Commission has, in consequence, been requested by union officials to investigate this discrimination. As yet there have been no threats of any sort. Managers of mines will probably not oppose any reasonable request for an increase in wages if such a request does not accompany a demand for union recognition. Two well-attended meetings of merchants and professional men have been held and a committee is investigating matters with the intention of soon reporting.

Changing Mt. Massive's Name has been resented. Leadville was quick to express its disapproval of the prerogative assumed by the U. S. Geological Survey in arbitrarily changing the name of Mt. Massive to Mt. Gannett. This mountain, long considered the highest in the state, is Leadville's favorite landmark. It was given its name by the very man whose name is now given to it. With all respect to this eminent geologist and topographer, residents of this city will refuse to adopt the new name, and endless confusion is certain to follow if the Federal Survey declines to rescind its action. The old name is peculiarly appropriate to this great mountain that is directly west of Leadville as a spur of the Sawatch Range. The city council passed resolutions of disapproval at the change. Sentimental resolutions have been passed by clubs and lodges and sent to the officials at Washington—the Leadville Pioneers Association document concluding: "Mount Massive is a name endeared to us by old associations and it's a heritage bequeathed to after-generations of our kindred. Therefore we plead for the retention of the ancient name."

SALT LAKE CITY—Oct. 25

Utah Power and Light Co.'s new 85-mi. transmission line from Provo to the coal mines in Carbon County, which has been under construction for several months, has been completed. The United States Fuel Co.'s mines at Hiawatha and Black Hawk are now using electricity.

New Copper Leaching Plant in course of construction by the Utah Copper Co. is making good progress. The plant is near the Magna mill at Garfield, and at a slightly greater elevation. The grading has been completed, and the crushing equipment and conveyor system is largely installed. The tanks are now being built. These are of reinforced concrete, approximately 50x100x 18 ft., and work on them is being done as rapidly as possible, so that they may be completed before freezing weather. The initial capacity will be about 4,000 tons of ore daily.

Local Ohio Copper Stockholders held a meeting recently at the offices of Moore, Mitchell and Maginnis, attorneys, to discuss plans for the reorganization of the company. Two plans have been presented, one by the International Mining and Refining Co., which has the Central Trust Co. as depository; the other by the North American Liquidation Co., with the Columbia Trust Co. of this city as depository. Further information concerning the proposed plans for reorganization was desired and telegrams were sent to William E. Rogers, of the North American Co. and to W. J. Brown, of the International, as follows: "Local stockholders at meeting here tonight, 31,000 shares represented, instruct us to advise both protective committees, and through them the court that they are very familiar with condition of property, Ohio Copper Mining Co., and its present potential value. They value highly their equity in the property, and desire and intend to do their full share by payment of suitable assessment or subscription for preservation of their equity and are anxious for definite action along this line. Other stock not represented at this meeting will join any reasonable plan organization. Plans only submitted tonight for first time. They find it impossible, without more mature thought and consideration, to analyze and choose between plans of the respective committees, both of which were presented at meeting. Signed, George Baglin, Fred Kuster, W. M. Havenor, local committee." Royalties amounting to $450,000 have been paid the Ohio Copper Co. by the General Exploration Co. since its lease started in June, 1915.

SPOKANE, WASH.—Oct. 20

Wood River District of Southern Idaho, 12 mi. north of Hailey, has recently come into prominence through the purchase of the Nay Aug and the Silver-Lead mines, the former by Raymond Guyer, general manager of the Rex Consolidated, and the latter by Darwin Utter, former surveyor general of Idaho. The Nay Aug has been worked intermittently for the last 30 years, and is credited with a gross production of $750,000. It is reported that the property will probably be transferred to the Idaho Exploration Co., a corporation in the process of formation for the purpose of developing Wood River holdings. The property contains two orebodies assaying at picked places as high as 40% zinc and it is estimated that 40,000 tons are available in the old workings for rapid extraction. In the Silver-Lead mine, it is thought, are similar orebodies, continuations of those of the Nay Aug. The property is virgin ground now being prospected by a tunnel 450 ft. long and lacking 150 ft. to reach ore.

JOPLIN, MO.—Oct. 21

Emma Gordon Mining Co. elected new officials at the ninth annual meeting, held recently in Miami. G. W. Bigham was reëlected president. This company has first lease on 200 acres of land, near Commerce, Okla., from which an average of $500,000 worth of ore has been produced annually for nine years. The land is owned by Mrs. Hiram McBee, whose maiden name was Emma Gordon, who has received royalties of from $2,000 to $4,000 monthly ever since operations were begun. There are now seven concentrating plants on the lease.

Possession of a Valuable Lease on Indian land in Oklahoma is given P. A. Ewert, of Joplin, by a decision of the Circuit Federal Court. The lease is on 100 acres of land near Picher. Several years ago before there was thought of ore on the tract, Ewert had an agent procure the lease and when ore was discovered near by the agent refused to turn over the lease because the contract with Ewert had not been in writing. Local courts decided against Ewert but the higher court sustained him, declaring the statute of frauds, which requires contracts in writing in such cases, was not intended to protect dishonest men.

Recovery of $174,000, Paid for a Mine, is asked by Roland R. Conklin, of New York, in a suit filed in the District Court here this week. He alleges that fraud was used in getting him to pay the amount named for two leases at Porto Rico, north of Duenweg, last March. The defendants are J. W. Ground, of Kansas City, and the Barnett Mining Co., with G. A. Barnett, of Joplin, as president. Conklin alleges that he was induced to pay $175,000 for the leases through misrepresentations as to the condition of the ground from a mineral standpoint. He further charges that an engineer he employed to investigate the property was bought off by representatives of the mining companies. Conklin is chairman of the board of directors of the Lincoln Zinc and Smelting Corporation, which has purchased four mines in this district since last fall, including, besides the one at Porto Rico, formerly known as the Barnett No. 1, the Bradley at Joplin and the Tom C. and Seneca at Prosperity.

TORONTO—Oct. 21

Consolidated Mining and Smelting Co.'s new issue of stock to the amount of $2,106,835 brings the total capital up to $10,534,375. In this connection it should be noted that the company has secured further zinc contracts, which will necessitate a considerable amount of new construction. The company is also going more extensively into the production of copper and has increased the capacity of its copper refinery, having secured an option on a copper property in the north end of Vancouver Island close to the water. The directors will shortly issue a statement pointing out that, for an enterprise producing on a fairly large scale no less than five metals, the capital is small as compared with that of many companies operating on a more restricted scale. The zinc plant is now making regular shipments which are expected to largely increase in volume.

Interest in the Nickel Question has been revived by the statement of Lord Robert Cecil, of the Imperial Government, to the effect that there is reason to believe that the nickel cargo of the "Deutschland" was a "part of the small stock mined in allied territory," and that precautions should be taken to prevent allied property getting into hostile hands. From the wording of his remarks it is not clear that he referred to Canadian nickel, and it is contended by the government press that he had New Caledonia rather than Sudbury in his mind as the original source of the "Deutschland's" cargo. Nevertheless his utterances, coupled with the report that another German submarine is on her way across the Atlantic looking for further supplies, have been eagerly seized upon by the scare-mongers to keep alive the agitation. In view of another general election, which is likely to take place within a few months, liberal campaigners are giving the question considerable prominence in their speeches.

The Mining News

ARIZONA

Cochise County

SHATTUCK-ARIZONA (Bisbee) — September production, 1,566,446 lb. copper, 26,928 oz. silver, 419 oz. gold and 805 tons lead ore shipped El Paso smeltery. Company earnings for nine months, $2,213,994, equivalent to $8.43 a share per annum.

Gila County

OLD DOMINION (Globe)—September smeltery output, 3,011,000 lb., compared with 3,600,000 lb. in August and 3,852,000 lb. in July. Smaller September output due to discontinuance of treatment of United Verde Extension ores averaging from 600,000 to 800,000 lb. copper monthly.

Mohave County

OATMAN UNITED (Oatman)—Resumed sinking three-compartment shaft recently.

SUNNYSIDE (Oatman)—Stockholders recently ratified sale of control to owners of United Eastern for $86,500.

BIG JIM (Oatman)—Rumored will soon start erection of mill larger than one now building by United Eastern.

SAN FRANCISCO (Oatman) — Recently incorporated for 1,250,000 shares, par value 10c. each, nonassessable. Will develop 40 acres adjoining United Eastern, lying between Fessenden and Oatman United.

Yavapai County

BRODY (Kirkland)—Small scale operations developed good sized oreshoot $8 per ton gold ore.

BLACK BEAUTY (Kirkland)—Good tonnage low-grade gold ore reported developed at shallow depth.

CALUMET & JEROME (Jerome)—Financed for several months developments. Shaft will be sunk to 1,100-ft. level where Daisy vein expected.

PIONEER (Kirkland)—Small force sinking shaft on Big Four. Recent carload shipment assayed high in lead with some gold and silver.

VESUVIUS (Kirkland)—Recent development rewarded by rich pockets at depth from which several shipments returned 6 to 7 oz. gold per ton.

BIG LEDGE DEVELOPMENT (Mayer)—Purchased old Treadwell smelter at Mayer and dismantling. Contemplate erecting complete modern smelter of 150 tons daily capacity.

CALIFORNIA

Amador County

REWARD (Pine Grove)—Crosscut disclosed 8-ft. ledge. Pine Grove mill now in commission.

BUNKER HILL (Amador City)—Collar of shaft concreted to depth of 225 ft. and concrete orebins on surface constructed. Regular monthly dividend withheld this month owing to conditions resulting from labor strike. E. Hampton, superintendent.

CONSOLIDATED AMADOR (Jackson)—New two-reel hoist in course of installation; capacity for lifting 15,600 lb. a distance of 2,000 ft. Rapid progress being made with construction work on surface, unwatering and repairing shaft; water at point just above 800 station. Last work in mine 30 years ago all on and above 800 level. Shaft has inclined depth of 2,100 ft.

Butte County

SOUTHERN CROSS (Forbestown)—Flotation plant installed will be tested in last half October.

CARLISLE (Forbestown)—Mine being unwatered to give opportunity to proposed investors to make examination.

FORBESTOWN CONSOLIDATED (Forbestown)—Gold Bank-Golden Queen properties being operated with prospect of disposal to Eastern investors. Group of 12 claims adjoining reported sold to Italian investors. The Fred Belk property reported sold to Mr. Hall, of Los Angeles. Extensive work in progress at Solano Wonder, situated southwest of New York placer ground.

Eldorado County

PYRAMID (Placerville)—High-grade ore reported disclosed in drift south of 500-ft. station. Shaft being deepened to 700 ft. Mine employs 24 men.

Inyo County

TUNGSTEN MINES (Bishop)—Shipment of concentrates valued at $20,000 reported recently. Mill now operating 11 concentrators working three shifts. Top of Little Sister hill being broken down and ore sent to mill; underground development also progressing. Howard Moore succeeded Cooper Shapley as superintendent.

Kern County

STRINGER DISTRICT developing new tungsten and gold deposits. Charles Hellmer and George Swarthouse encountered placer deposit showing $8 gold and 10 lb. sheelite per ton. A. M. Carter, operating dry washing plant, has several tons good dirt ready for jigging.

KING SOLOMON (Randsburg)—Last cleanup Sept. 29 at new 5-stamp mill netted $4,700. Mill installed about five months ago and produced about $50,000 since.

BUTTE LEASE (Randsburg)—New screening mill in operation. Stamp mill will be installed. Large amount low-grade ore blocked out and high-grade ore being developed. John M. Taylor, manager.

Mariposa County

BONDURANT (Coulterville)—Hazel Belle and other properties situated 12 mi. east reported sold by A. L. Adams, of Bridgeport, Conn., to Eastern men, represented by George R. Stone, of Bridgeport.

Nevada County

CALIFORNIA (Grass Valley)—Water being lowered rapidly. The 280-ft. shaft will be deepened and drifts will be driven in course of development. Property recently purchased by King C. Gilette, the safety-razor man. Robert D. Adams, manager.

Shasta County

McKEEN (Callahan)—Oil flotation contemplated by James McKinney, of Los Angeles. Development in progress for six months past; 50-ton per day tube mill installed.

MAMMOTH (Kennett)—Friday-Lowden tunnel now in 3,300 ft.; 700 ft. remains to be driven to strike orebodies. Another tunnel being driven at Sutro mine, now in 600 ft. and will be extended to about 3,000-ft. point.

MIDAS (Knob)—Diesel 250-hp. engine now en route from Pennsylvania will be installed for unwatering mine flooded to the 1,300-ft. level when mine was on fire three years ago. Substitution of oil for other fuel will reduce fuel bill about 50%.

Tuolumne County

NYMAN MINES (Jamestown)—Reported purchased old Santa Ysabel property. Mine situated between towns of Stent and Quartz, immediately adjoining the App on south. Property long idle; developed several years ago by 1,000-ft. shaft and several drifts; equipped with hoist and other machinery and stamp mill. Company developed for about year and purchase resulted.

COLORADO

Boulder County

LITTLE FRED (Salina)—New process treating tungsten ore will be installed. Property recently sold Kansas men for $25,000.

FERROALLOYS (Utah Junction)—Plant for manufacture ferrotungsten from tungsten concentrates nearing completion. Company subsidiary of Rare Metals Co. owning tungsten concentrating mill near Rollinsville, Gilpin County. Plant will be operated early in 1917; process will include electric smelting. Power line being built from substation of Colorado Power Co. near Lakewood.

Clear Creek County

LAMARTINE (Idaho Springs)—Broderick Mining Co. acquired control.

COLORADO CENTRAL (Georgetown)—Dumps sampled recently estimated to contain 460,000 tons ore averaging $7 a ton.

IMPERIAL (Georgetown)—Being developed and operated under lease by Lindall & Eckberg. Payable ore opened and trial shipment made.

BRODERICK (Freeland)—Developing Lamartine property with 25 men. Mine being carefully sampled and assays made by W. G. Arkills, of Idaho Springs. Force at mine will be increased rapidly as possible. Extensive exploration planned.

CONSOLIDATED MINES DEVELOPMENT CO. (Alice)—Newly incorporated with capital of $1,500,000 by W. G. Harper, W. C. Bickford and W. G. Luckenga to acquire lode and placer mining property in Clear Creek County. Development now in progress on one of the company's properties near Alice.

CAPITAL (Georgetown)—Rich strike made last month developing favorably. Slab of rich gold ore stripped for horizontal distance of 25 ft. and about 40 ft. in height. Samples from drillings across 40 in. of vein indicate average value of $3,500 a ton. Slab from 8 to 10 in. wide contains pockets assaying as high as 1,000 oz. gold a ton.

METALS MINING AND LEASING CO. (Idaho Springs)—Newly incorporated with capital of $25,000 to develop and operate mining properties in Clear Creek and Gilpin Counties. Directors are A. H. Roller, J. E. Leet and L. F. Wells. Principal office, Idaho Springs. Development will begin soon on properties now controlled under lease.

Gilpin County

RUNNING LODE (Central City)—Mine machinery being repaired; bailing water will commence at once.

PITTSBURGH (Central City)—Shoot of shipping-grade gold-copper ore opened recently in winze between 1,000- and 1,100-ft. levels, 400 ft. from shaft. Shoot 8 in. wide in places and assays 6 oz. gold, 18% copper and well in iron.

Lake County

NEW MONARCH (Leadville)—Will sink Monarch shaft another 200 ft.

BURGE (Leadville)—Contract let for driving tunnel through porphyry on Red Mountain. Expected oreshoot will be opened at porphyry-granite contact.

Park County

OSWEGO MINING AND MILLING CO. (Alma)—Reopening old Magnolia mine and Eddy mill at Montgomery, 6 mi. north of Alma. Mine above timberline on North Star Mountain will be connected with mill by aërial tram having vertical drop of 1,200 ft. in distance of 3,700 ft. In addition to mill's present cyaniding equipment, flotation will be installed. Louis L. Davis, of Denver, manager.

San Juan County

MAYFLOWER (Silverton)—Rich ore opened recently in mine under lease and bond to Mears and Slattery of Silverton.

DORA (Silverton)—Contract for sinking shaft secured by Clay Johnstone. Three shifts to be employed and work rushed to completion.

KLONDYKE (Silverton)—New buildings including boarding and bunk house, compressor building and blacksmith shop under construction. New machinery being installed. Mine development to begin soon.

Summit County

PIONEER CONSOLIDATED (Breckenridge)—Work on boarding and bunk house being pushed so force of 25 men can be increased. Remodeling Extension 25-stamp mill under way. Separate building constructed for crushers, new foundation built under entire mill and power changed from steam to electricity. Power line construction to mill completed.

WELLINGTON (Breckenridge)—Planned to reorganize company, eliminating Wellington Mines Co. of Arizona, holding company of Wellington Mines Co. of Colorado. Former capitalized for $10,000,000 and latter for $50,000. New company to be capitalized for $1,000,000, stockholders in old company to exchange stock pro rata.

Teller County

CRESSON (Cripple Creek)—Reported rich strike made on 12th level. Shoot said to be 16 to 30 ft. wide and assaying $30 gold.

IDAHO

Idaho County

MOTHER LODE (Elk City)—Robt. Brownell bought third interest. Development started on main tunnel east of shaft giving depth of 100 ft.

BLACK PINE (Elk City)—Upraise started on lower tunnel at distance of 1,250 ft. from portal uncovered high-grade ore. Free gold plainly visible on face of vein. Mill ready to start operations. S. J. Rieben, manager.

Shoshone County

TAMARACK & CUSTER (Wallace)—Closed down temporarily pending installation of tramway connecting mine with Frisco mill recently purchased, after which production resumed.

GOLDEN CHEST (Murray)—Tests of new mill pronounced satisfactory by superintendent Berlin. Because auriferous and tungsten ores treated nearly same gravity, considerable remodeling necessary at first to save values. Ores dry crushed, screened, jigged and concentrated on Wilfleys.

WEST HECLA (Burke)—Drifting on vein believed extension of main vein of neighboring Hecla mine. Drift starts 1,800 ft. in from portal of crosscut and vein followed for 100 ft. shows promising mineralization—vein has dip and strike of Hecla vein. Morton Webster, of Wallace, president.

LACLEDE (Burke)—Capitalization increased from 1,000,000 to 1,500,000 shares, par value $1. Additional stock issue intended to finance further development and equipment. Present development consists 1,600 ft. of tunnels, 1,200 ft. of drifts, and 300 ft. of shafts opening four mine levels. No commercial ore encountered. Operations suspended till February, when extensive development will be undertaken.

MICHIGAN

Copper

AHMEEK (Ahmeek)—Has installed 40 Denver drills—speed of driving thereby greatly increased.

WHITE PINE (Ontonagon)—Rock from developments on 200-ft. level reported averaging 30 lb. copper per ton.

KEWEENAW (Mandan)—Stamp mill in operation but reported as tuning up. Will handle 250 tons daily with one head.

HANCOCK (Hancock)—Shipping over 700 tons daily. No. 7 lode rich and very narrow—stoping on five levels from 66th to 71st.

CALUMET & HECLA (Calumet)—Subsidiaries increased rock production 15,000 tons in first half October over similar September period.

TAMARACK (Calumet)—Regrinding plant housing completed but no machinery installed. Future uncertain since retirement of Calumet & Hecla management.

WAUKULLA (Matchwood)—New exploration will be undertaken 5 mi. west of the Copper Crown. Shipping in supplies, H. Hillegas, Houghton, manager.

MICHIGAN (Rockland)—Reported paying development costs by sales mass and barrel copper from new workings in Butler Lode. Rock reported averaging 25 lb. per ton.

MAYFLOWER-OLD COLONY (Calumet)—Suspension of diamond drilling reported a preliminary step to sinking shaft to serve both properties operated as one.

MOHAWK (Mohawk)—In September shipped to mill 58,209 tons rock averaging 19.67 lb. yield per ton. Copper production 1,145,762 lb., compared with 1,049,460 lb. in August.

OLD FLINT STEEL (Rockland)—Reopened under management Samuel Brady after idleness since 1875. Property in vicinity of the Michigan; produced less than 1,000,000 lb. copper from fissure opened by three shafts; owned by New York men and present operations financed by New York City option holders.

Iron

LAKE (Ishpeming)—More men added to night shift crew. Production will be increased.

NORTH LAKE (Ishpeming)—Three diamond drills at work west of the Morris-Lloyd shafts.

TRADERS (Iron Mountain)—Ordered to keep mine working all winter. Prospect of higher prices for iron ore next season is incentive.

PABST (Ironwood)—Addition being built to boiler house. New boilers will be added. Change made because of electrification project under way.

VOLUNTEER (Palmer)—Mine abandoned—ore supply exhausted. All machinery removed from underground. Little ore left in stock will be shipped before navigation closes. Shaft sunk in 1906 and property worked most of time until last week. Steel shaft house dismantled.

MINNESOTA

Cuyuna Range

HOCH (Manganese)—Output being shipped to Algoma Steel Corporation, Sault Ste. Marie, Ont. Produces manganiferous iron ore only. Work on new No. 2 shaft progressing rapidly—will be 150 ft. deep when completed.

Mesabi Range

BRAY (Keewatin)—Mine to be reopened by Republic Iron and Steel Co. after idleness since 1913.

NORMAN (Virginia)—Ore supply about exhausted. Most of ore being milled, trammed and hoisted through shaft—too deep for shovel work now—was deepest pit property on range.

ELIZABETH (Chisholm)—Will be reopened. Little work ever done and has been idle several years. A 500-gal. electric pump and other machinery ordered. Estimated 200,000 tons ore in sight.

OLIVER (Eveleth)—Contract let for drainage ditch to drain that portion of mining property lying west and southwest of Eveleth. Contract price $125,000. Will be constructed of concrete greater part of distance. Will be 50 ft. deep in spots.

Vermilion Range

SIBLEY (Ely)—Old Sibley No. 1 shaft, vertical, will be abandoned Jan. 1, 1917, by which time new 65° incline shaft will be ready to operate. Headframe from Savoy mine being erected for use at new shaft, after change from 80° to 65°.

MISSOURI-ARKANSAS

Joplin District

CROWN POINT (Duenweg)—This former soft-ground mine opened up rich run sheet ground at 170 ft., in new shaft.

CORNFIELD (Cardin, Okla.)—Drilling on northwest quarter forty-acre lease disclosed good orebody. New shaft started.

NEARBY (Webb City)—Moving Stephenson mill from Porto Rico to lease on Center Creek ground between Webb City and Carterville. Disseminated formation at 175 ft. Mill ready by Jan. 1.

TAR CREEK (Cardin, Okla.)—Sinking shaft to second ore level, having beaten water to 190 ft. Making carload premium lead in upper level weekly. Product 83.5% metallic lead.

GROUND & BARNETT (Joplin)—New mill on Burch land at Duenweg started. Largest mill in district for treatment calamine exclusively. Mining at 130 ft. Four shafts in ore. No trams—surface railway with mule power.

KAHOMA (Commerce, Okla.)—Company took over Merchant's Mining Co.'s lease—consideration, $30,000. Company consists of Muskogee and Salem, Va., men, with W. A. Woods, of Commerce, manager. Shafts will be sunk and new mill erected.

HARTFORD (Joplin)—Moving mill from Galena to site of Old Fort mine at Duenweg. Enlarging and improving plant and adding nine sludge tables. New capacity approximately 500 tons 10-hr. shift. Sheet ground at 235 ft. One of shafts enlarged and concreted down to lime.

ARKANSAS

EDITH (Rush)—Records for production in field broken by company during week, when 31 tons of high-grade calamine was recovered over new mill in 9 hr. New orebody encountered in heading of 300-ft. tunnel week ago and almost carload of concentrate averaged daily since.

MONTANA

Cascade County

GREAT FALLS REDUCTION WORKS (Great Falls)—C. F. Kelley, managing director of Anaconda Copper, announced work started upon foundation of baghouse to collect lead now carried out by fumes from reverberatory furnaces heretofore wasted. Structure to cost $100,000, will be finished by end of year. Building, 50x150 ft., and will contain 1,440 bags. Zinc plant present output 60 tons zinc per day will be increased soon as necessary machinery is received.

Silver Bow County

BUTTE & ZENITH CITY (Butte)—Crosscutting on 1,000 level in property near Nissler, 6 mi. west of Butte, proceeding steadily. Indications in south crosscut of nearing vein cut by shaft between 700 and 800 levels.

BOSTON-BUTTE COPPER AND ZINC CO. (Butte)— Secured patent to Walker claim, located north of Anaconda company's Nettie mine in western Butte district. Company now owns 12 claims in district. Reported that, encouraged by showing made in Nettie, company may soon undertake extensive development.

BUTTE & SUPERIOR (Butte)—At present production rate October output expected to reach 55,000 tons as against 50,150 tons in September, with production of 16,000,000 lb. zinc. In spite of increase, earnings will show decrease, due to spelter price drop. New No. 3 shaft timbered down to 1,500 level used for lowering supplies and men until new hoist is in place—not expected until end of year.

BUTTE DULUTH (Butte)—Preparations for starting operations completed. By end of month new management under Al Frank will begin mining and treating 100 tons per day which will be increased gradually to 500 tons, amount called for under contract by Aug. 1, 1917. Average ore runs 1.6% copper. Expected recovery of 80% with output 500 tons would mean 300,000 lb. copper per month.

NEVADA

Esmeralda County

GRANDMA CONSOLIDATED (Goldfield)—Has closed deal for adjoining ground which practically doubles present area.

GREAT BEND (Goldfield)—Recent carload shipment asayed $83 per ton. Several small lots milling-grade ore sent out for flotation tests.

SILVER PICK (Goldfield)—Core drill now working from surface near northwestern boundary of property. Management states previous drilling disclosed west dipping veins yielding good assays.

Lincoln County

MEADOW VALLEY LEASE (Pioche)—Have crosscut Yuba dike and drifted to connection with old Yuba workings on 1,200-ft. level. Propose to raise to old 1,100-ft. workings. Some ore being stoped.

Mineral County

SILVER DYKE MINES (Tungsten)—Property will be closed down Nov. 15 owing to impossibility of producing at profit under present market conditions.

OLYMPIA MINES (Mina) Erecting 50-ton cyanide plant on Royal George group about 30 mi. from Mina. Six-mile pipe line supplying water to mill completed.

Nye County

TONOPAH ORE PRODUCTION for week ended Oct. 14 was 8,855 tons valued at $175,330, compared with 8,602 tons for week previous. Producers were: Tonopah Belmont, 2,829 tons; Tonopah Extension, 2,380; Tonopah Mining, 1,200; Jim Butler, 1,150; West End, 627; Halifax, 213; Rescue-Eula, 156; North Star, 53; Miscellaneous leases, 247 tons.

TONOPAH BELMONT (Tonopah)—Has acquired option on control of Panama-Pacific group claims lying in Tonopah eastern section.

MONITOR BELMONT (Belmont)—Work at Highbridge tunnels continues and old Belmont incline will be retimbered to second level. Flotation plant running since last July. Shipping concentrates. About 30 men employed.

TONOPAH EXTENSION (Tonopah)—Has purchased ground of Tonopah Sully Mining Co. embracing about 80 acres adjoining northern boundary of Tonopah Extension. Northerly crosscut being run from 1,540-ft. level of Victor shaft to develop new ground.

TONOPAH MINING (Tonopah)—Heavier equipment placed at Sand Grass shaft which will be deepened additional 150 ft. In quarter ending Aug. 31, gross value ore milled, $336,287; gross value mill products, $310,030; total expenses, $212,982; net earnings, $97,047; miscellaneous income, $40,970; exploration expense, $15,305; net income, $122,712. Cash on hand, $36,172; bonds purchased, $1,019,831; certificates of deposit, $25,000; unchanged silver bullion stored at 50c. per oz., $431,010; total after dividends, $1,362,014.

Storey County

SIERRA NEVADA (Virginia)—Continued reopening old north drift on 2,500 level; north drift from No. 1 stope all in quartz at 75-ft. point.

UNION (Virginia)—Large amount development work and new prospecting drifts started. Ore extracted from 2,500 level averaged $28. Mine worked on five different levels.

UNITED PUMPING ASSOCIATION (Virginia)—One of vertical turbine sinking pumps placed in position at top of Mexican and Ophir winze ready for lowering; to be used for lowering water from 2,700 to 2,900 level.

NEW MEXICO

Grant County

SANTA RITA DEVELOPMENT (Santa Rita)—Bought group 15 claims adjoining Chino, bringing total holdings to about 700 acres. Stock recently listed on New York Curb. W. W. Lawhon, president; H. W. Loomis, general manager.

UTAH

Beaver County

HORN SILVER MINES (Frisco)—Articles of incorporation for this company—successor to Horn Silver Mining—filed recently. Acquires entire holdings of old company. Capitalization $400,000; shares $1 each; stock unassessable.

Juab County

IRON BLOSSOM (Silver City)—Drift to north on 1,700 cut fissure carrying several inches copper. Thought to be near copper oreshoot to north but main body not expected for some distance. Copper ore opened on 600, 1,100, 1,200 and 1,300 levels.

EAGLE & BLUE BELL (Eureka)—Shaft reached 1,950 level, and another 100 ft. of sinking thought possible before reaching water level. Shaft in ore most of distance from 1,832-ft. point; station cut at 1,875 ft., and some development done. Object of work on this level is to get under 100-ft. winze sunk in ore from 1,700—about 125 ft. farther on. Ore being shipped from shaft sinking and development.

Salt Lake County

UTAH APEX (Bingham)—Suit filed recently against company by Utah Lead and Copper, asking for injunction, alleging trespassing on Susquehanna and Venice North Extension lode claims. Order also asked to enter workings and ascertain amount and value of ore alleged taken.

BINGHAM MINES (Lark)—Earnings for past three months reported $15,000 per month, exclusive of Eagle & Blue Bell. Latter mine forced to operate for last five months at one-third normal capacity owing to smeltery failure to handle ore. Output recently increased from 50 to 150 tons daily.

MONTANA-BINGHAM (Bingham)—Tunnel in 4,180 ft., and 100 ft. of 900 ft. recently contracted for completed. Face in quartzite in Bingham Amalgamated ground. Raise being sent up from near face by Congor is up 600 ft.; will connect with surface workings. Karns tunneling machine and machine drills used for tunnel work.

EMMA COPPER (Alta)—New diamond drill hole—known as No. 7—reported cut ore, showing galena in brecciated limestone. No. 7 is 50 ft. from No. 6, and down 260 ft. Slight delay caused by repairs to transmission lines. Old shaft being repaired and pumped out; water now down 100 ft. Pumping to be continued to 250 ft., when work will be started to reach ore. Excavating for new bunk and boarding houses being done to care for winter force.

OHIO COPPER (Bingham Cañon))—Proposed reorganization of foreclosed company will call for what amounts to assessment of only $1 per share on the old stock. New company of 2,500,000 shares capitalization will exchange its stock share for share with old stock on payment of $1 per share. This will raise $1,300,000, there being 1,300,000 shares of old stock, and will leave 1,200,000 shares of new stock available for other corporate purposes. With $1,300,000 thus raised, proposed, with permission of courts, to redeem properties and assets of company sold at foreclosure. New plan financially underwritten and requires only approval of courts. Understood bondholders who bought in property will raise no objection to proposed plan.

Summit County

PARK CITY SHIPMENTS for week ended Oct. 13 amounted to 3,415,470 lb. by nine shippers.

IOWA COPPER (Park City)—At annual meeting L. R. Perry elected president. Company developing claims on Scott Hill near head of Thaynes Cañon, in mineralized zone extending from Park City to Big Cottonwood.

AMERICAN FLAG (Park City)—Shipment being accumulated by Park City Mines Co. lessees, from pay streak 15 in. wide on 1,000 level. Ore assays well in gold, silver and lead. Drifting and raising in ore being done.

JUDGE MINING AND SMELTING (Park City)—On dividend checks recently sent out following notice appended: "This money comes from Utah mines; you and your friends can help us by voting 'No' on tax amendment to constitution, which, if passed, will be a blow to every industry in the state."

VIRGINIA

VIRGINIA SMELTING (Norfolk)—Chloridizing leaching plant partially destroyed by fire Oct. 19. Cause believed defective electric wiring. Adjacent portion of plant leased to Norfolk Smelting Co., though threatened by fire, escaped damage.

WEST VIRGINIA

Kanawha County

ROESSLER & HASSLACHER (St. Albans)—Representatives of Perth Amboy, N. J., firm have bought 175 acres 2 mi. west of St. Albans and 14 mi. from Charleston on which to build plant costing about $1,000,000.

WYOMING

Park County

MIDWEST SULPHUR (Cody)—Purchased additional 160 acres adjacent territory doubling holdings. Reported producing 25,000 lb. sulphur every 24 hours and earning 45% annually on $55,000 capitalization. Stock recently listed on Salt Lake Mining Exchange.

CANADA

BRITISH COLUMBIA

SILVER QUEEN (Hazelton)—Bonded to F. H. Dakin, of San Francisco, who has taken personal charge—commenced development.

LE ROI NO. 2 (Rossland)—In August shipped 1,507 tons ore; smelter returns on 1,287 tons, $17,380; total revenue, $17,554; total expenses, including diamond drilling, $7,926.

GRANBY CONSOLIDATED (Vancouver)—September production of two smelteries totaled 3,440,035 lb. copper compared with over 4,000,000 lb. each for May, June and July. Discrepancy due to strikes resulting in both coke and labor shortage.

SILVER STANDARD (Hazelton)—New vein found in tunnel 500 ft. from portal, 150 ft. below surface and 90 ft. beyond where first vein was cut. New vein 12 in. wide of solid zinc blende and grey copper. First vein shows 3½ ft. high-grade ore; drifted on for 50 ft.

HUNTER GROUP (Telkwa)—Property bonded for $35,000 from William Hunter by W. B. Moore and associates of San Francisco. Number of men put at work. Group is oldest location in Hunter Basin, staked in 1903. Ore is bornite and chalcopyrite carrying gold and silver.

COPPER MOUNTAIN (Similkameen)—British Columbia Copper Co.'s main tunnel driven 1,300 ft. since June 15 and proving correct the results given by preliminary diamond drilling showing 5,000,000 tons above this level. Adit when in 2,000 ft. will give maximum depth of 200 ft. and ore above will be mined by glory hole.

DOMINION GOVERNMENT ASSAY OFFICE (Vancouver)—Expects to handle gold to value of $6,000,000 to $7,000,000 per annum. Gold amounting to about $3,000,000, from Trail refinery formerly sent to Tacoma will now go to Vancouver. About $1,000,000 a year expected from Hedley, and balance will be made up from Yukon and other sources.

CONSOLIDATED MINING AND SMELTING (Trail)—Announced new issue of $2,106,835 worth stock offered to stockholders at rate of one of new to four shares of old holdings. Issue will increase total capitalization to $10,534,375. Purpose of new issue is to provide payment for recent building. Shipments to smeltery for September were 42,838 tons. Electrolytic zinc plant turning construction and funds for further extension of out about 20 tons spelter daily.

Manitoba

MOOSE (Gold Lake)—Shaft down about 150 ft. and quantity of high-grade ore taken out.

GOLD PAN (Gold Lake)—T. A. B. Price, of Boston, accompanied by two mining engineers, left to make examination of property and begin active development.

Ontario

LA BELLE KIRKLAND (Goodfish Lake)—Shaft down 350 ft. on vein 11 ft. wide, yielding good milling ore.

PEOPLES (Cobalt)—Crosscut on lower level reached vein crossing property, which is about 8 in. wide and shows some mineralization.

R. A. P. SYNDICATE (Boston Creek)—Operations suspended during repairs and installation of new equipment, including tables for sorting ore.

LAKE SHORE (Kirkland Lake)—Installation of 7-drill compressor and other machinery completed. Development will be resumed with auxiliary steam plant until electric power available.

McINTYRE (Porcupine)—Report for three months ending Sept. 30: Mill treated 35,810 tons, of which 28,933 tons was McIntyre ore, average grade, $9.08 per ton; operating cost, $4.93 per ton; gross value of product, $262,863; operating profit, $107,844; total profits, including receipts from milling custom ore and subsidiary companies, about $136,000. In stope on 1,000-ft. level of main shaft, orebody from 8 to 30 ft. wide and averages $15 per ton.

CUBA

CUBAN POTASH FIELDS VALUELESS according to report of engineer appointed by Cuban government. Report states 50 analyses made of samples from alleged potash mine showed nonexistence of potash in commercially profitable quantities. Respecting samples obtained by Americans who registered the claim and obtained widespread publicity through "New York Times," report says samples misleading and resulted either from series of natural concentrations impractical on industrial scale—or result of artificial means.

AFRICA

Transvaal

GOLD PRODUCTION IN SEPTEMBER was: Witwatersrand, 744,881 oz.; outside districts, 26,686 oz.; total, 771,567 oz., being 9,583 oz. less than in August. For the nine months ended Sept. 30 the total production was 6,733,917 oz. in 1915, and 6,945,671 oz.—or $343,567,030—in 1916; an increase of 211,754 oz. Native Labor Association reports number of Kafirs at work in September in gold mines, 197,734; coal mines, 10,239; diamond mines, 6,527; totaling 214,500.

PRINCESS ESTATE (Johannesburg)—In September crushed 22,400 tons, yielding £28,445 gold; estimated profit, £1,224.

MAY CONSOLIDATED (Johannesburg)—In September crushed 13,170 tons, yielding £9,680 gold; estimated profit, £686.

GEDULD PROPRIETARY (Johannesburg)—In September crushed 26,800 tons, yielding £40,729 gold; estimated profit, £12,619.

MODDERFONTEIN DEEP (Johannesburg)—In September crushed 40,400 tons, yielding £76,596 gold; estimated profit, £43,768.

ASIA

India-Mysore

KOLAR GOLD FIELD total gold production in September was 45,225 oz., being 106 oz. less than in August and 821 oz. less than in September, 1914. For the nine months ended Sept. 30 the total was 409,284 oz. in 1915, and 402,493 oz. in 1916; a decrease of 6,791 oz. this year.

Chosen

ORIENTAL CONSOLIDATED (Unsan)—Mailed returns for August: 200 stamps ran 29.9 days; crushed 26,895 tons; gross receipts, $132,660; operating costs, $76,721; operating profits, $55,938. Cost development and improvements, $1,439; total net profit, $54,498.

The Market Report

Metal Markets

NEW YORK—Oct. 25

A good business was done last week in all of the metals. Copper and lead were very strong at unchanged prices. Spelter and tin advanced.

Copper, Tin, Lead and Zinc

Copper—The volume of business transacted last week was much larger than in the previous week, the estimated total being about 30,000,000 lb. Nearly all of this was for delivery in the first quarter of 1917, which continues to be the major market, and was done at 27¼c., or the equivalent thereof. Some producers having sold all they wanted to at that price raised their asking price to 27¾c., r. t. on Oct. 25, but copper was easily available from other quarters at the old price. Near-by and December copper is very scarce, but producers regain control of small supplies toward the end of the month, through release of safety reserve, failure of buyers to forward specifications, etc. November copper in relatively small quantity was sold for export at 29@29½c., f.o.b. New York. December copper was quoted at 28@28½c., r. t. January copper sold at 27¾c. r. t. There was some business taken for delivery over the first six months of 1917 at considerably less than current prices. In some quarters there appeared to be considerable desire to negotiate such business.

Transactions last week were chiefly with domestic consumers, especially brass makers. There was some buying from England, especially for early shipment. The British government supplies British manufacturers at the mean quotation for electrolytic on the London Stock Exchange. If they are able to buy elsewhere on better terms they may do so. With the London quotation at £144 this week, that was possible, but the net equivalent here of £144, London, depended much upon freight contracts. There were reports from London of increasing supplies of Japanese copper offered there. France was not a buyer, the French government apparently taking care of consumers on more advantageous terms out of its previous purchases.

Copper Sheets, base price, nominally 37½c. for hot rolled and 38½c. for cold rolled for delivery at mill convenience. Earlier deliveries mainly on toll basis. Wire 32@32½c., nominal.

Copper Exports from Atlantic ports in September are estimated at 29,900 gross tons.

Copper Exports from Baltimore for the week were 4,607,499 lb. bars and ingots to Archangel, Russia; 3,807,301 lb. copper and 92,643 lb. brass tubes to Great Britain.

Tin—Business was active both in spot and futures. At the beginning of the week spot was 41¼c., and futures, 40⅝c. At the close the quotations were 41½ and 41c., respectively. The trouble over British permits has become more acute and is now a real difficulty in doing business. Evidently the British government desires to increase the stock of tin in England, which has been allowed to run down.

Lead—There were no specially noteworthy features in this market and no material change either in conditions or prices. Demand was somewhat better than in the previous week.

Spelter—A large domestic demand, especially from galvanizers in the Middle West, together with buying by dealers, speculators, etc., caused this market to move sharply upward up to Oct. 23, when a considerable volume of business for early delivery was done at 10c. Interest then died out and the market became more or less nominal. The total volume of business during the week was not large, but this market at present is highly sensitive and responds quickly and sharply to relatively small demand, or conversely, relatively small selling pressure. Considerable business for delivery in the first quarter of 1917 was done at prices not greatly below those for early delivery. Producers seemed desirous of selling all they could for distant delivery at current prices.

Exports from Baltimore for the week included 391,435 lb. spelter to Liverpool.

Zinc Sheets are in good demand and base price remains $15 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

NEW YORK—Oct. 25

Aluminum—Demand good and supplies still scarce. Deliveries mainly on contract. The quotation is unchanged at 65@67c. for No. 1 ingots, New York.

Antimony—Market strong at 13@14c. There is evidently an effort to bull the market, and the trade expects higher prices. There is believed to be justification for an upward movement in the present statistical position. Some of the large foreign producers have no stocks here and are quoting only on shipments from China and Japan.

Quicksilver—Market steady at $80 per flask. San Francisco reports, by telegraph, $77.50, market steady.

Nickel—Market steady and unchanged at 45@50c. per lb. for ordinary forms; with 5c. premium for electrolytic metal.

Gold, Silver and Platinum

NEW YORK—Oct. 25

Gold—There was a cross-current in the gold movement early in the week, $5,000,000 arriving at New York from Ottawa on Oct. 20, while on the same day a shipment of $500,000 was made from New York to Montreal.

Exports of gold and silver coin and bullion from Japan for the six months ended June 30 were $12,869,690 in 1915, and $1,786,924 in 1916. Imports show as great a change, being $1,685,024 in 1915, and $14,944,892 this year.

Gold Exports and Imports in the United States in September are reported as below:

	1915	1916	Changes
Imports.....	$42,062,449	$92,562,940	I. $50,500,491
Exports.....	2,033,990	6,849,141	I. 4,815,151
Excess, imports.	$40,028,459	$85,713,799	I. $45,685,340

In September, 1914, the gold imports were $2,761,590; exports, $21,887,202; leaving $19,125,612 excess of exports.

Silver—The last advices from London are that the appearance of the market is not so robust as in preceeding weeks, though the undertone continues good. The India Bazaars have not been keen buyers, and as shipments show some increase, there has been some recession in price the past week.

Mexican Dollars in New York were quoted Oct. 19 at 52¼@55¼c.; Oct. 20 and 21 at 52½@55¼c.; Oct. 23 at 52⅛@55⅛c.; Oct. 24 at 51⅞@54⅞c.; Oct. 25, at 51¾@54¾c. Business small.

Platinum—Market steady at $90 per oz. There was a brisk demand, almost entirely from jewelers, who are preparing for the holiday trade.

Palladium—Sales at $80 per ounce.

Zinc and Lead Ore Markets

Platteville, Wis., Oct. 21—Quotations of the district are according to the following figures: Base price per 2,000-lb. ton for material assaying 60% zinc is $63.50 for premium ore down to $58 for medium grade. For material assaying 80% lead the base price per 2,000-lb. ton is $78@80. Shipments for the week were 3,297 tons of zinc ore, 115 tons of lead ore, and 857 tons of sulphur ore. For the year to date the figures are 103,922 tons of zinc ore, 3,578 tons of lead ore, and 25,281 tons of sulphur ore. Shipped during the week to separating plants, 2,587 tons of zinc ore.

Joplin, Mo., Oct. 21—Price quotations per 2,000 lb.; Blende, high, $72.50; 60% zinc, premium ore, $70; medium grades, $70@67; low, $65. Calamine, per ton 40% zinc, $45@38; average selling price, all grades of zinc, $63.37 per ton. Lead, high price, $86.30; base, $87@80. Average selling price, all grades of lead, $80.24 per ton.

Shipments of the week: Blende, 8,082 tons; calamine, 895 tons; lead, 1,172 tons. Value, all ores the week, $664,990; the year to date, $30,087,520.

Blende prices have been higher than now, but seldom is the market of the strenuous nature reached this week, with second and even third rate ore as high as premium ore, and fourth rate ore within $2 of the highest grades. Very little of the week's shipment was purchased under $68 base, merely sufficient to make a low mark of $65. Unsold blende stock is now limited to 1,000 tons Webb City and 8,000 tons Miami, with 5,000 tons calamine over the district.

Butte, Mont., Oct. 20—The Butte & Superior Mining Co. for September reports 48,809 tons of ore milled with recovery of 12,694 tons of concentrates assaying 54% zinc.

Other Ores

Manganese Ore—Sales of two cargoes of manganese ore from Brazil are reported at prices that work out about 70c. per unit of manganese at tidewater.

Imports at Baltimore for the week included 13,200 tons manganese ore from Brazil.

Tungsten Ore—Quotation unchanged at $17 per unit.

Charles Hardy reports under date of Oct. 24, "After the great activity during the first half of the month, a slight lull has been experienced during the past week. I know of only about 150 tons that were disposed of, but the inquiries for the largest quantities possible, especially for European account, continue in the market and negotiations for a contract up to and including the whole year of 1918 are well advanced."

Tungsten ore exports from Burma nine months ended Sept. 30 are reported at 2,136 tons, an increase of 616 tons over last year.

SILVER AND STERLING EXCHANGE

Oct.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Oct.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
19	4.7563	67⅛	32 7/16	23	4.7563	67⅛	32⅛
20	4.7563	67⅛	32⅛	24	4.7569	67⅛	32⅛
21	4.7563	67⅛	32⅛	25	4.7569	67⅛	32⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Oct.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
19	27 @27⅛	41⅛	7.00	6.90 @6.92½	9.37½ @9.62½
20	27 @27⅛	41⅛	7.00	6.90 @6.92½	9.50 @9.75
21	27 @27⅛	41⅛	7.00	6.90 @6.92½	9.62½ @9.87½
23	27 @27⅛	41⅛	7.00	6.90 @6.92½	9.87½ @10.12½
24	27 @27⅛	41⅛	7.00	6.90 @6.92½	9.87½ @10.12½
25	27 @27⅛	41⅛	7.00	6.90 @6.92½	9.87½ @10.12½

The quotations herein are our appraisal of the average markets for copper, lead, spelter and tin based on wholesale contracts for the ordinary deliveries of the trade as made by producers and agencies; and represent, to the best of our judgment, the prevailing values of the metals, reduced to basis of New York, cash, except where St. Louis is basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The price quoted for copper on "regular terms" (r.t.) is the gross price including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.25c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Prime Western brands. Only St. Louis price is given, St. Louis being basing market. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Oct.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
19	124	120	143½	179½	180½	30½	53
20	124	120	143½	179½	180½	30½	54
21	...	...	...	...	...	...	...
23	124	120	143½	180	181½	30½	54
24	124	120	144	179½	181	30½	54
25	124	119	144	181½	182½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. Copper quotations for electrolytic are subject to 3% discount. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21½ cents.

Antimony Ore—Market reported a little firmer. High class ore in small quantities was sold at $1.30 per unit.

Molybdenite—Market, $1.70@1.80 per unit. Sharp competition among domestic, Canadian and European buyers, both for prompt and forward shipments, advanced price. Supplies of ore small.

Iron Trade Review

NEW YORK—Oct. 25

There is no material change in the iron and steel markets. The demand for export is heavy and insistent. Domestic orders are less active, high prices having operated to discourage construction to some degree.

The pig-iron market is strong with a tendency to advance. Most contracts now placed run well over into next year.

The Navy Department has called for bids on 45,583 tons of armor plate to be submitted Nov. 1. The Department is also calling for many bids on guns of various sizes, shells, and on plate for shipbuilding.

PITTSBURGH—Oct. 24

Some steel mills have been urgently in need of coal because car shortage has cut down shipments on their regular contracts, involving coal at $1.25@1.30 per net ton at Pittsburgh district mine, and they have been buying spot the past week at $4.25@4.50 for steam and $4.75@5 for gas. This has put other buyers largely out of the market, but the steel mills themselves are threatened with a fuel famine. At present, however, steel production is at record rate, October weather being always favorable to large outputs.

The steel mills find themselves oversold despite their very large production and increased reserve is being shown in the acceptance of orders. Open contracts for specification in future have been accepted for about as far ahead as the mills care to commit themselves. Prices show an advancing tendency.

The quotation of 3c. on plates, since the middle of August the official quotation for shipment at mill convenience, has become nominal. Even car plates are at 3.10c. minimum, while ordinary buyers are not quoted below 3.25c. even for delivery second half 1917.

Pig Iron—The market is less active but more excited. Consumers are now well covered through this year and fairly well for the fore part of next year, but there is a question whether furnaces can make full shipments. We quote: Bessemer, $24@25; basic, $20@21; foundry and malleable, $21@22; forge, $20.50@21.50, f.o.b. Valley furnaces, 95c. higher delivered Pittsburgh.

Steel—Billets are not quotably changed but sheet bars are stronger, at $50 minimum. Wire rods are $60@65. Forging billets are $70@75 for deliveries over the next few months. On shell quality billets 4.25c. per lb. has been done in several recent sales and 4.50c. has been bid in one case.

Ferroalloys

Ferrosilicon is higher, the quotation for 50% having been advanced to $100 per ton at furnace.

Spiegeleisen is steady and strong, 20% being quoted at $40@45 per ton at furnace.

Ferrotungsten Exports from the United States were 140 lb. in July; for the seven months to July 31 they were 8,407 lb. These include tungsten metal as well as ferrotungsten.

Ferromanganese—Regular quotations remain at $164 for imported and $165 for domestic on contract but there have been some sales at less and the market is rather irregular.

Iron Ore

The demand for bessemer and low-phosphorus iron for export has caused a corresponding call for iron ores of bessemer grade. Some Old-Range bessemer ores from Lake Superior are reported sold to Pennsylvania furnaces at $5.20 at Lake Erie ports, or 75c. above the season schedule. Some purchasers of Spanish low-phosphorus ores are reported at 13@14c. per unit of iron.

Shipments of Lake Superior ore have been interrupted by a week of hard, stormy weather.

Coke

Connellsville—Still fancier prices have been paid for spot furnace coke, $6.25 being done Friday, $7 on Saturday, $7.50 yesterday morning and $7.25 yesterday afternoon, the market being unchanged and inactive today. It is claimed the high prices have been paid only by brokers, for coke to apply on contracts, furnaces not having paid over $4. Car and labor shortage are holding down production while furnaces are working so well that they are calling for unusually large tonnages. We quote: Spot furnace, $7.25@7.50; contract, nominal, $3.75; spot foundry, $5@6; contract, nominal, $3.75@4.50, per net ton at ovens.

Chemicals

NEW YORK—Oct. 25

The general markets show little change. The tone continues good with a steady business in heavy chemicals.

Arsenic is in fair demand, with prices steady at $6@6.25 per 100 lb., according to quantity.

Copper Sulphate—Sales have been fair and prices firm at $11@12.25 per 100 lb., according to size and terms of order.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct. 24
Alaska Gold M.	12½
Alaska Juneau	7½
Am. Sm. & Ref., com.	110½
Am. Sm. & Ref., pf.	118
Am. Sm. Sec., pf. A	96
Am. Sm. Sec., pf. B.	89½
Am. Zinc	46½
Am. Zinc, pf.	77
Anaconda	94½
Batopilas Min.	2
Bethlehem Steel	616
Bethlehem Steel, pf.	136½
Butte & Superior	64½
Chile Cop.	23½
Chino	58½
Colo. Fuel & Iron	54½
Crucible Steel	89
Dome Mines	24
Federal M. & S.	20½
Federal M. & S., pf.	40½
Great Nor., ore ctf.	43½
Greene Cananea	51½
Homestake	133
Inspiration Con.	65½
International Nickel	51
Kennecott	53½
Lackawanna Steel	86½
Miami Copper	39½
Nat'l Lead, com.	69
National Lead, pf.	114½
Nev. Consol.	22½
Ontario Min.	6½
Quicksilver	2½
Quicksilver, pf.	3½
Ray Con.	26
Republic I. & S., com.	78½
Republic I. & S. pf.	112½
Sloss-Sheffield	60
Tennessee Copper	23
U. S. Steel, com.	119
U. S. Steel, pf.	121½
Utah Copper	101
Va. Iron C. & C.	49

N. Y. CURB†	Oct. 24
Buffalo Mines	.95
Butte & N. Y.	1½
Butte C. & Z.	8
Caledonia	.57
Can. Cop. Corpn.	2½
Cashboy	.05
Cerro de Pasco	38½
Con. Ariz. Sm.	2
Con. Coppermines	2½
Con. Nev.-Utah	.25
Crystal Cop.	.93½
First Nat. Cop.	4½
Florence	.70
Goldfield Con.	.57
Goldfield Merger	.08
Granite	.40
Hecla Min.	7½
Howe Sound	5½
Jerome Verde	2
Joplin Ore & Spel.	.43
Kerr Lake	4½
Magma	21½
Majestic	.52
McKinley-Dar-Sa.	.62
Mother Lode	.38
Nevada Hills	.18
N. Y. & Hond.	14½
Nipissing Mines	8½
Oro	‡.03
Ray Hercules	3½
Rochester Mines	.57
St. Joseph Lead	19½
Standard S. L.	1½
Stewart	⅛
Success	.36
Tonopah	6⅛
Tonopah Ex.	4½
Tribullion	.25
United Zinc	4½
White Knob, pf.	1½
White Oaks	4½
Yukon Gold	2½

SAN FRAN.*	Oct. 24
Alta	.04
Andes	.11
Best & Belcher	.06
Bullion	.02
Caledonia	.35
Challenge Con.	‡.05
Confidence	.11
Cons. Imperial	.01
Con. Virginia	.12
Gould & Curry	.03
Hale & Norcross	.05
Jacket-Cr. Pt.	.03
Mexican	.14
Occidental	.65
Ophir	.23
Overman	.03
Savage	.11
Seg Belcher	‡.02
Sierra Nevada	.30
Union Con.	.61
Utah Con.	.02
Belmont	4.25
Jim Butler	.90
MacNamara	.11
Midway	.23
Mont.-Tonopah	‡.21
North Star	.16
Rescue Eula	.24
West End Con.	.70
Atlanta	.09
Booth	.10
C.O.D. Con.	.03
Comb. Frac.	.06
D'field B.B.	.05
D'field Daisy	.05
Jumbo Extension	.35
Round Mountain	.36
Sandstorm Kendall	‡.04
Silver Pick	.19
Central Eureka	‡.05
Argo	.08
Ariz. Central	.10
Big Jim	1.25
Lazy Boy	.06
Oatman No. Star	‡.14
Tom Reed	2.20
United Eastern	3.75½
United Western	.06

BOSTON EXCH.*	Oct. 24
Adventure	3
Ahmeek	104
Algomah	1½
Allouez	70
Ariz. Com., ctfs.	12½
Bonanza	.40
Butte-Ballaklava	2
Calumet & Ariz.	78
Calumet & Hecla	570
Centennial	21
Copper Range	71
Daly West	2½
East Butte	16½
Franklin	9
Granby	90½
Hancock	13½
Helvetia	.25
Indiana	3
Island Cr'k, com.	49
Island Cr'k, pfd.	91½
Isle Royale	33
Keweenaw	6½
Lake	13½
La Salle	4½
Mason Valley	4½
Mass	16½
Mayflower	2½
Michigan	4½
Mohawk	94
New Arcadian	6½
New Idria	14
North Butte	20½
North Lake	1½
Ojibway	1½
Old Colony	2½
Old Dominion	69½
Osceola	90
Quincy	91
St. Mary's M. L.	88
Santa Fe	2½
Shannon	9½
Shattuck-Ariz.	28½
So. Lake	6
So. Utah	.27
Superior	15½
Superior & Bost.	4½
Tamarack	45½
Trinity	6½
Tuolumne	.67
U. S. Smelting	72½
U. S. Smelt'g, pf.	51
Utah Apex	3¾
Utah Con.	14½
Utah Metal	7½
Victoria	5½
Winona	4½
Wolverine	45
Wyandot	1½

BOSTON CURB*	Oct. 24
Bingham Mines	9½
Boston Ely	.72
Boston & Mont.	.85
Butte & Lon'n Dev.	.59
Calaveras	5½
Calumet-Corbin	.02½
Chief Con.	2
Cortez	.35
Crown Reserve	.45
Davis-Daly	3
Eagle & Blue Bell	1½
Houghton Copper	1
Iron Cap Cop., pf.	5½
Mexican Metals	.42
Mines of America	2½
Mojave Tungsten	3½
Nat. Zinc & Lead	.55
Nevada-Douglas	1⅛
New Baltic	2½
New Cornelia	17½
Ohio Copper	13
Oneco	.80
Raven Copper	‡.07
Rex Cons.	.29
Rilia	.11
United Verde Ext.	39

SALT LAKE*	Oct. 24
Big Four	1.00
Black Jack	.09
Cardiff	7.30
Colorado Mining	.19
Crown Point	.05½
Daly-Judge	8.00
Emma Cop.	2.68½
Gold Chain	.15
Grand Central	.60
Iron Blossom	1.70
Lower Mammoth	.05
May Day	13½
Opohongo	.01½
Prince Con.	1.32½
Seven Troughs	‡.03
Silver-King Coal'n	2.75
Silver King Con.	3.52½
Sioux Con.	.16
So. Hecla	2.00
Uncle Sam	.06
Wilbert	.08½
Yankee	.15

TORONTO*	Oct. 24
Bailey	.07½
Beaver Con.	.40
Chambers Feriand	.17
Coniagas	4.75
La Rose	.61
Peterson Lake	.20
Right of Way	.05
Seneca Superior	.09
T. & Hudson Bay	70.00
Temiskaming	.61
Wettlaufer-Lor.	.10
Dome Exten.	.32½
Dome Lake	.61
Foley O'Brien	.70
Hollinger	6.70
Jupiter	.28
McIntyre	1.56
Newray	.75
Porcu. Crown	.70
Vipond	.35
West Dome	.34

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Oct. 24
Doctor Jack Pot	.09½
Elkton Con.	.10
El Paso	.41
Findlay	.03
Gold Sovereign	.05
Golden Cycle	2.40½
Granite	.72
Isabella	.23
Jack Pot	.05
Mary McKinney	.32
Portland	1.90
Vindicator	1.75

LONDON	Oct. 11
Alaska Mexican	£0 15s0d
Alaska Tre'dwell	3 0 0
Burma Corp.	4 5 0
Cam & Motor	0 11 0
Camp Bird	0 7 6
El Oro	0 9 6
Esperanza	0 11 6
Mexico Mines	3 17 6
Nechi, pfd.	0 13 6
Oroville	0 16 9
Santa Gert'dis	0 11 6
Tomboy	1 1 0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1914	1915	1916	1914	1915	.16
January	56.572	48.855	56.775	26.553	22.731	26.960
February	67.506	48.477	56.755	26.573	22.753	26.975
March	58.067	50.241	57.935	26.788	23.708	27.597
April	58.519	50.250	64.415	26.958	23.709	30.662
May	58.175	49.915	74.269	26.704	23.570	35.477
June	56.471	49.034	65.024	25.948	23.267	31.060
July	54.678	47.519	62.940	25.219	22.597	30.000
August	54.344	47.163	66.083	25.979	22.780	31.498
September	53.290	48.680	68.515	24.260	23.591	32.584
October	50.654	49.385	.....	23.199	23.925	.....
November	49.082	51.714	.....	22.703	25.094	.....
Dec.	49.375	54.971	.....	22.900	26.373	.....
Year	54.811	49.684	.....	25.314	23.675	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1915	1916	1915	1916	1915	1916
Jan.	13.641	24.008	60.756	88.083	65.719	116.167
Feb.	14.394	26.440	63.494	102.667	*	133.167
Mar.	14.787	26.310	66.152	107.714	*	136.000
April	16.811	27.895	75.096	124.319	*	137.389
May	18.506	28.625	77.600	135.457	*	152.522
June	19.477	26.601	82.574	112.432	95.333	137.455
July	18.796	23.865	76.011	95.119	91.409	125.500
Aug.	16.941	26.120	68.673	110.283	82.333	126.304
Sept.	17.502	26.855	68.915	113.905	85.250	134.071
Oct.	17.686	.....	72.601	.....	88.000	.....
Nov.	18.627	.....	77.744	.....	93.273	.....
Dec.	20.133	.....	80.773	.....	100.430	.....
Year	17.275	.....	72.532	.....	.....	.....

Tin	New York		London	
	1915	1916	1915	1916
January	34.260	41.825	156.550	175.548
February	37.415	42.717	176.925	181.107
March	48.426	50.741	180.141	193.609
April	47.884	51.230	169.225	190.736
May	38.790	49.125	162.475	196.511
June	40.288	42.231	167.636	179.466
July	37.423	38.510	167.080	168.357
August	34.389	38.565	151.440	169.870
September	33.125	38.830	152.625	171.345
October	33.080	.....	151.554	.....
November	39.224	.....	167.670	.....
December	38.779	.....	167.000	.....
Av. year	38.590	.....	163.960	.....

Lead	New York		St. Louis		London	
	1915	1916	1915	1916	1915	1916
January	3.729	5.921	3.548	5.826	18.606	31.167
February	3.827	6.246	3.718	6.164	19.122	31.988
March	4.053	7.136	3.997	7.375	21.883	34.440
April	4.221	7.630	4.142	7.655	21.094	34.368
May	4.274	7.463	4.182	7.332	20.347	32.967
June	5.932	6.936	5.836	6.749	25.170	31.011
July	5.659	6.352	5.531	6.185	24.611	28.137
August	4.656	6.244	4.520	6.088	21.946	29.734
September	4.610	6.810	4.490	6.699	23.151	30.786
October	4.600	.....	4.499	.....	23.994	.....
November	5.155	.....	5.078	.....	26.278	.....
December	5.355	.....	5.266	.....	28.807	.....
Year	4.673	.....	4.567	.....	22.917	.....

Spelter	New York		St. Louis		London	
	1915	1916	1915	1916	1915	1916
Jan.	6.386	16.915	6.211	16.745	30.844	89.810
Feb.	8.436	18.420	8.255	18.260	39.819	97.762
Mar.	8.541	16.846	8.360	16.676	44.141	95.048
April	10.012	16.695	9.837	16.525	49.888	99.056
May	14.731	14.278	14.610	14.106	68.100	94.217
June	21.208	11.752	21.038	11.582	100.614	68.591
July	19.026	8.925	18.856	8.755	97.250	50.750
Aug.	12.781	8.730	12.611	8.560	67.786	51.587
Sept.	13.440	8.990	13.270	8.820	67.841	52.095
Oct.	12.800	.....	12.596	.....	66.536	.....
Nov.	15.962	.....	15.792	.....	88.409	.....
Dec.	15.391	.....	15.221	.....	89.400	.....
Year	13.230	.....	13.054	.....	67.553	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported.

Pig Iron, Pitts.	Bessemer‡		Basic†		No. 2 Foundry	
	1915	1916	1915	.916	1915	1916
January	$14.59	$21.60	$13.45	$18.78	$13.90	$19.70
February	14.55	21.16	13.45	18.93	13.90	19.51
March	14.55	21.81	13.45	19.20	13.95	19.45
April	14.55	21.65	13.45	18.95	13.95	19.45
May	14.61	21.78	13.60	19.11	13.83	19.58
June	14.70	21.95	13.67	18.95	13.77	19.34
July	14.94	21.95	13.91	18.95	13.68	19.20
August	16.01	21.95	15.31	18.95	14.75	19.25
September	16.86	22.88	15.95	19.58	15.70	19.53
October	16.95	.....	15.96	.....	15.80	.....
November	17.57	.....	16.47	.....	17.20	.....
December	19.97	.....	18.44	.....	18.95	.....
Year	$15.82	.....	$14.76	.....	$14.95	.....

‡ As reported by W. P. Snyder & Co.